

N A T I O N A L B I S O N R A N G E

Refuge Narrative Report

Calendar Year 1965

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UNITED STATES DEPARTMENT OF THE INTERIOR

Bureau of Sport Fisheries and Wildlife

Fish and Wildlife Service

Moiese, Montana

N A T I O N A L B I S O N R A N G E

Refuge Narrative Report

Calendar Year 1965

PERMANENT PERSONNEL

Cordia J. Henry, Refuge Manager (Retired 4/24/65)
Joseph P. Mazzoni, Refuge Manager (EOD 6/4/65)
Frank L. Kenney, Refuge Manager (Ninepipe)
Jack L. Richardson, Ass't. Refuge Manager (Trans. 3/26/65)
Melvin T. Nail, Ass't. Refuge Manager (EOD 12/1/65)
Victor B. May, Refuge Maintenance Foreman II
Grant Hogge, Mechanic
Ernest W. Kraft, Maintencenceman III
Gladys C. Young, Clerk-Typist
Forest L. Largent, Maintencenceman I, WAE
Edward G. Krantz, Maintencenceman I, WAE

TEMPORARY PERSONNEL

Arnold A. Bauer, Laborer
James H. Putnam, Maintencenceman I
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William J. Lampshire, Laborer
Robert G. Neuman, Laborer
Robert W. Taylor, Laborer
Joan M. Johnson, Clerk-Typist
Grant J. Hovde, Maintencenceman I
Edmond G. Priddy, Maintencenceman I
Herbert L. Thompson, Foreman I, Butcher
Lester R. Winn, Laborer

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N A T I O N A L B I S O N R A N G E

Refuge Narrative Report

January 1 to December 31, 1965

I. GENERAL

A. Weather Conditions

The weather for the year may be summarized as being generally mild with above average precipitation.

Considerable snow was received during the forepart of the year, but depths rarely exceeded four to six inches throughout the refuge. Heavy, intermittent winds in early January caused much drifting, and the formation of snow drifts ranging up to thirty feet in depth was not uncommon on the north slope of Highpoint and similar areas. Temperatures during this period remained above zero, and crusted snow did not become a problem. The thermometer dropped to seven degrees below zero on March 24, the lowest temperature experienced during the year. The occurrence of beautiful, sunny weather during February and March was sufficient to release the lethargic human soul from the depths of winter's gloom and periodically remove much of the accumulated snow cover, particularly from the lower elevations.

Weather during the spring, summer and early fall months was quite mild with minimum temperatures rarely falling below freezing. A total of 10.95 inches of rainfall was received during the months of April through September, with no less than one inch of rain falling in any one month.

The weather during October and November was the type that native Western Montanans enjoy talking about. Beautiful, "Indian-Summer" weather prevailed.

The first significant snowfall for the current winter was received on December 22, amounting to only one-and-a-half inches at headquarters and about three inches at Highpoint. This light snow cover remained until the evening of December 27, when extremely strong "Chinook" winds came up out of the west and blew unmercifully for nearly forty-eight hours. At the end of this period, all snow on the refuge and throughout the Flathead Valley had melted. An additional two-and-a-half inches of snow fell at headquarters at the end of December, and persisted through the heralding of the New Year.

A total of 15.01 inches of precipitation was received during the year, or 2.27 inches more than the fifteen-year-mean for the period 1950 through 1964. This is the third highest annual precipitation recorded at headquarters for the same period.

B. Habitat Conditions

1. Water

With the amount of precipitation experienced, and the pattern in which it was received, moisture requirements were amply fulfilled throughout all seasons of the year.

Following heavy rains in late August, the flow of water in Mission Creek approached the record high experienced during the serious flood which occurred in June of last year. The stream receded rather quickly, did no serious damage and, of course, had no affect on the few waterfowl broods raised on this waterway. The sudden, heavy flow in Mission Creek was apparently limited to the Mission Creek drainage as the Jocko River and other nearby drainages did not experience comparable increases in flow.

2. Food and Cover

Vegetative growth and range forage production was again excellent this year. Grass remained green through August, the third time in 35 years, and with mild, moist conditions during the fall, greened up again in October and November. An abundance of perennial bunch-grass seedlings was observed on most range sites, an indication that seed production in 1964 was quite good, and that conditions for successful germination were present this spring. The response to improved seed production, available soil moisture, and the third year of deferred grazing, in the critical Alexander Basin range was particularly gratifying. This large (3,450 acres), important range has a long, early history of overuse as a buffalo wintering area. Although there probably has been little change in species composition during the past five to ten years, we now have positive indications that the unit is responding to improved grazing practices. With continued seasonal deferment and proper range use, the grass forage resources in the Basin should show steady improvement.

The response of the various browse species, principally snowberry, Symphoricarpos occidentalis, hawthorn, Crataegus douglasii, serviceberry, Amelanchier alnifolia, and mock orange, Philadelphus lewisii, to the increased deer and elk disposal programs practiced for the past several years, and, undoubtedly, improved soil moisture conditions, has become increasingly apparent. During a range inspection tour in October, University of Montana Range Specialist, Melvin Morris, who has had a long, active association with the Bison Range, commented that shrub species on the range have made a remarkable recovery during the past ten years. A study of mule deer and elk food habits on the Bison Range, conducted by Mr. Morris and Refuge Manager John E. Schwartz between November 1951 and November 1952, indicated that, "The large percentage of grass in the samples of both deer and elk suggests either a high preference for grass or a limited supply of more desirable forage. -----Our range survey and the heavily browsed condition of this class of forage, particularly on

chokecherry, serviceberry and mock orange, do imply that shrubs were in limited supply." Mr. Morris indicated that the supply of browse species in the 1951-1952 study area, the Pauline Pasture (now divided by a contour fence into Upper and Lower), was vastly increased. Terminal growth on chokecherry, for example, has commonly increased five to ten feet since the period of study.

II. WILDLIFE

A. Migratory Birds

1. Waterfowl

Waterfowl wintering in the Flathead Valley remained somewhat dispersed as a result of the mild weather experienced. Concentrations along Mission Creek, which can be expected to increase to 5,000 to 10,000 birds when local reservoirs and potholes remain ice-covered for prolonged periods, did not occur.

The greatest waterfowl use occurred in mid-March, when about 1,000 ducks, predominantly mallard, widgeon, pintail and golden-eye, gathered along Mission Creek at headquarters to partake of the daily grain ration. Canada goose numbers were similar to those recorded in 1964, with no more than 100 coming to feed during the winter months.

Production was again quite poor in our resident Canada goose flock, which numbered about twenty birds during the nesting season. Only two nests were located in early April, and both hatched. The broods numbered three and four goslings, respectively, but disappeared late in May when they were about half grown. We don't know what may have happened to them, but suspect the abundant population of striped skunks along Mission Creek may have been a factor.

Canada goose production in the Flathead Valley generally was considered to be quite good, although perhaps not particularly significant in terms of the Flyway population, with an estimated 365 birds produced. Unfortunately, few if any of these birds remained at the end of the hunting season. The goose hunting season in the Valley was closed early by the State of Montana on December 10, when it was determined that the kill, approximately 450, had exceeded local production.

Duck production in the Valley was considered to be fairly good, and the number of broods observed on the small amount of available waterfowl nesting habitat on the Range appeared to be considerably above normal. We use the words, "appeared to be", because we had an extremely active Student-Trainee this summer who made most of our brood observations. It is entirely possible that indications of increased production may have simply been a reflection of more intensive field work. The first brood of the year, a cinnamon or blue-winged teal, was seen on June 8. A total of nineteen broods was observed including; four cinnamon and/or blue-winged teal broods with

29 ducklings; five mallard broods with 34, one gadwall brood with 8, one redhead brood with 8, one shoveller brood with 6, one pintail brood with 6, three widgeon broods with 17, two wood duck broods with 19, and one common merganser brood with 5. We have made no attempt to estimate total production, but feel reasonably sure that the broods recorded represent 80 to 90 percent of the total broods produced on the refuge.

Virtually all of the waterfowl banding work, to fulfill Regional quotas, is now done on the Ninepipe and Pablo Refuges; however, a total of 165 mallards was banded on Mission Creek at headquarters between January 21 and February 27 to help fulfill the post-season banding quota established for the three refuges.

2. Other Water Birds

Great blue herons were common along Mission Creek and on the Ravalli Ponds, although we probably had no more than ten birds on the refuge at any one time. One pied-billed grebe was observed on the Ravalli Ponds on several occasions during June.

3. Shore Birds

Spotted sandpipers, the Wilson and northern phalaropes, and killdeer were all quite common on the Ravalli Ponds. A total of 71 Wilson phalaropes was observed there on September 9. One sora rail was seen in the Elk Pasture on July 12.

4. Mourning Doves

The annual coo-count was conducted on June 6, with a total of 59 doves observed. Doves were abundant throughout the refuge and numbers reached an estimated 300 to 400 during June.

B. Upland Game Birds

Ring-necked pheasant numbers remained low throughout the Lower Flathead Valley. Production was quite poor and the status of the Valley pheasant population was again the subject of heated debate at local sportsmen's meetings. Available pheasant habitat on the Bison Range is rather marginal, and populations this year, with frequent movements to and from the refuge, probably did not exceed 100 birds.

Gray partridges experienced an excellent production year, with broods of eight to twelve chicks common. The total refuge population was estimated at 300 birds at the end of the year. We had only observed two chukar partridges by the end of August, and had concluded that our chukar population was approaching the vanishing point. Much to our surprise, a covey of 30 chukars was observed in Trisky Creek on September 30, and again on October 3. An additional twelve birds were observed near Tower 2 on November 19. Where these birds were during the bulk of the year is a mystery to us, considering the amount of time devoted to horseback reconnaissance trips

through the range during the summer months. Despite unfavorable production conditions since the severe winter losses experienced in January of 1963, a small group of birds has maintained a tenacious hold on life and may be expected to recover rather quickly, given proper conditions.

Blue grouse have apparently done rather well again this year. A total of four broods was observed, and observations of adult birds were common throughout the conifer types at higher elevations. Thirty-one birds were seen during the buffalo roundup on October 7 and 8. The refuge population is estimated at 60 birds.

Ruffed grouse occur, infrequently, along Mission Creek and the Jocko River, but very few are present on the refuge. Only one bird was observed this year, and was sighted on Wildhorse Mesa on February 27.

C. Big-game Animals

1. Buffalo

With optimum weather and forage conditions throughout most of the year, the buffalo herd did exceedingly well. We did experience an unusually high incidence of loss, which will be discussed in detail under Section I. Diseases.

The deferred grazing program initiated in 1963 was continued this year. On April 14, all of the buffalo were moved from the Alexander Basin and confined to the Lower South and Lower West ranges. The gates in the contour fence were opened on June 2 to allow the buffalo to drift into the higher elevation ranges, and on June 21, all interior fence gates were opened and the animals were allowed access to all pastures on the range. Following roundup in October, the range herd was confined to the Upper North and Upper South ranges, until the week of December 13, when they were allowed to drift into the Sheep Pasture. The butcher herd was confined to the Sheep Pasture until butchering began on November 29. The range herd will be moved into the Upper West Range in mid-January of 1966, where they will remain throughout the balance of the winter. The natural drift of buffalo from the Upper North and Upper South Ranges, through the Sheep Pasture, thence into the Upper West Range, allows us to close the gates behind them with a minimum of riding.

Over-utilization of available grass forage by buffalo in the Lower Pauline and east portion of the Lower South Ranges was evident this summer, with most of the use occurring, unfortunately, during the critical growth period, May through June. The animals were left on these areas three to four weeks longer than would have been desirable. With the expansion of our deferred grazing program and eventual adoption of a rest-rotation grazing system, which is discussed elsewhere in this report, we are hopeful that the development of situations such as this may be avoided in the future.

The annual roundup of the buffalo herd was conducted during the period October 7 through 12. On Thursday and Friday, October 7 and 8, ten riders worked the south half of the range pushing the animals either into the upper end of the Elk Lane or into the Alexander Basin above the contour fence. On Monday, October 11, eleven riders made the final drive and had all the animals in the corrals by 1:00 P.M. During the course of the roundup, it appeared that only five bulls in the 4 to 9 age group (probable) had successfully evaded the riders; however, our final herd tally indicated that three additional animals apparently were missed.

This year, for the first time in the history of our brucellosis vaccination program, heifer calves only were vaccinated as the herd was worked through the chutes. This resulted from a determination by the U.S.D.A., Agricultural Research Service, Animal Health Division, which supervises our brucellosis control program, that vaccination of bull calves is no longer necessary or desirable. Our best explanation for this decision has come to us through Refuge Manager Robert C. Fields, Fort Niobrara Refuge, by copy of a letter from Charles C. Capen, D.V.M., Ph.D., Assistant Professor, Ohio State University. Dr. Capen's letter reads, in part, "The reason male animals are not vaccinated is the propensity for the organism to localize in the testicle and epididymis of some animals and be spread in the semen. One important consideration, and for which I do not have a definite answer, is whether contact of the males with vaccinated females is capable of elevating the serum antibody titer of the former to reactor levels. The vaccine strain of Brucella abortus is avirulent although viable. When calves are properly inoculated with strain 19, organisms should not be shed in the genital discharges or milk." With the long brucellosis-free history of our buffalo herd and other species of big game animals, we shouldn't have any particular problem.

John Corcoran, D.V.M. with the U.S.D.A from St. Ignatius, and Bob Manlove, State Livestock Inspector, Missoula, were on hand for the vaccinating and ear-tatooing work.

The ten-year branding cycle, 1961 through 1970, was continued with all calves branded with a "5" on the left hip, below the tail, and tatooed with a "V-5" inside the left ear. As a matter of record, all calves are branded and tatooed each year with a number corresponding to the year in which they are born. The brands are alternated from left to right to left, etc., in 10-year cycles. In 1971, for example, we will begin a new cycle with a "1" placed on the right hip and a "V-1" in the left ear. The tatoo is not alternated, but remains on the left side, inside the left ear at all times.

The U.S.D.A. asked that we place numbered, metal ear tags on all live sale animals destined for inter-state shipment this year. Our facilities at the corrals are not presently designed to handle animals larger than calves for this type of work and we experienced a certain amount of difficulty. Three of the yearlings selected for live sales broke their horns at the base, against the side of

the chute during the tagging operation and had to be returned to the range herd. The skin around the base of the broken horns on these three animals was not torn, and the breaks should heal completely within a short time (although the broken horn may not necessarily heal in its proper position). We apparently are going to have to continue ear-tagging our out-of-state live sale animals, and plan to make the necessary improvements to the chutes for proper handling of these animals prior to the 1966 roundup.

We were unable to reconcile the 1965 herd tally figures with those from 1964. According to last year's figures, we should have had 379 animals plus this year's calf crop of 102, less sixteen known losses during 1965, or a total of 465 head. According to the tally made at roundup, we had a total of 462 animals, leaving three unaccounted for. With the amount of riding that was done throughout the summer and, particularly, during September and early October when the period of our greatest losses occurred, we feel confident that we didn't miss this many dead animals. We also feel sure that our tally at roundup was accurate as to the animals observed. The difference then, can only be explained by assuming that three animals were missed on the roundup that were not seen by anyone. Shortly after the animals were released back to the range following roundup, several different buffalo were observed west of the Elk Lane. Although we can't be positive that these animals didn't work through the west fence of the Upper South Range, we feel reasonably sure that they were the animals missed. According to our roundup tally and subsequent records, the composition of our range herd at the close of the year is as follows:

RANGE HERD COMPOSITION, DECEMBER 31, 1965

<u>Age Group</u>	<u>Males</u>	<u>Females</u>	<u>Total</u>
10 years and older	2	13	15
4 to 9 years	40	53	93
3 years	11	16	27
2 years	17	15	32
Yearlings	44	25	69
Calves	<u>44</u>	<u>51</u>	<u>95</u>
TOTALS	158	173	331*

* Discounting the three animals unaccounted for during roundup.

The first calf of the year was noted on April 22, with the peak calving period occurring in mid-May. A total of 95 calves, out of 102 born in 1965, survived to December 31, 1965, giving us an initial production of 94 percent from 109 breeding-age cows, and a 93 percent calf survival. The production figures from 1954 to the present are summarized in the table on the following page:

ANNUAL CALF PRODUCTION, 1954 - 1965

<u>Year</u>	<u>Production</u>	<u>Year</u>	<u>Production</u>
1954	90%	1960	80%
1955	90%	1961	94%
1956	92%	1962	84%
1957	84%	1963	91%
1958	95%	1964	94%
1959	90%	1965	94%

Production for this twelve-year period has averaged 89.8 percent, which is quite good. Of course, in determining the number of calving age cows, we count only those cows three years of age and older. We know from the pregnancy records maintained during butchering, that calves are occasionally born to two-year-old heifers. This is normally quite unusual, and would have little affect on the calculated production percentage.

The sex ratio of animals of calving age returned to the range was 97 cows to 67 bulls, as compared to 109 cows and 73 bulls last year.

The probable cause for the occasional sudden decreases in production, e.g., 1957, 1960 and 1962, has previously been discussed in detail in the September-December Narrative Reports for 1960 and 1962. A high incidence of Leptospirosis pomona was noted in blood samples taken in 1960 and 1962 and apparently persists in the herd. For as yet unexplained reasons, the disease becomes virulent at irregular intervals, manifesting itself in a reduced calf crop (at least this is our assumption).

The roundup and corral activity generally went quite smoothly and without any particular problems. The addition of a catwalk across the top and around the west side of the second cutting pen, and a small "bull pen" near the gate to the third cutting pen, effectively eliminated the need for men to work in these two pens with the animals. The cutting did go somewhat slower, but, and most important, the chance for a repetition of the near-tragic accident which occurred during the 1964 roundup was no longer a serious concern.

Loading of the two, two-year-old heifers and one, two-year-old bull destined for the new buffalo exhibition pasture at Fort Peck, on the Charles M. Russell Wildlife Range, gave us more trouble than we bargained for. The two cows were loaded with little effort, but the bull declined to cooperate. The rear gate opening on the Charles M. Russell truck proved to be too wide and the gate too cumbersome. The bull made the trip into the truck, around the loop and out again before the gate could be forced down in front of him. After an hour or so of fruitless persuasion, the loading was finally completed, but we hadn't seen the last of the bull. Before the truck reached Missoula, the drivers discovered that he had torn off a horn, exposing a nasty hole in his skull. The animal was returned to the Bison

Range, exchanged for another bull, and butchered. The meat was donated to several local schools through the Flathead Agency.

The following table summarizes the weights of animals weighed during the roundup activities:

TABLE 1: LIVE WEIGHTS, ROUNDUP, OCTOBER 1965

<u>Age</u>	<u>Sex</u>	<u>No. Animals Weighed</u>	<u>Average Weight (pounds)</u>	<u>Extremes</u>	
				<u>Largest Animal</u>	<u>Smallest Animal</u>
Calf	M	33	332	410	170
1	M	7	690	770	590
2	M	9	974	1220	820
3	M	5	1210	1360	1000
4	M	5	1455	1530	1400
5	M	8	1677	1900	1480
6	M	4	1580	1750	1500
7	M	1	1590	--	--
8	M	1	1820	--	--
9	M	1	1750	--	--
10	M	1	1760	--	--
11	M	None	--	--	--
12	M	None	--	--	--
13	M	None	--	--	--
14	M	2*	1545	1550	1540
15	M	1	1460	--	--
Calf	F	44	320	380	220
1	F	1	710	--	--
2	F	4	840	970	640
3	F	8	868	950	780
4	F	9	962	1040	875
5	F	5	984	1100	880
6	F	2	975	990	960
7	F	3	982	1040	910
8	F	4	1028	1080	980
9	F	1	950	--	--
10	F	5	993	1075	830
11	F	1	1060	--	--
12	F	None	--	--	--
13	F	2	1025	1040	1010
14	F	None	--	--	--
15	F	1	1180	--	--

* Fort Niobrara bulls transferred to the Bison Range in 1952.

For comparison, the table on the following page summarizes the average weights taken on 1,681 buffalo since our stock scales were installed in 1957 (excluding 1960, when all weights had to be discarded).

TABLE II: LIVE WEIGHTS TAKEN AT ROUNDUP
OCTOBER 1957 - 1965, EXCLUDING 1960

<u>Age</u>	<u>Sex</u>	<u>No. Animals Weighed</u>	<u>Average Weight (pounds)</u>	<u>Extremes</u>	
				<u>Largest Animal</u>	<u>Smallest Animal</u>
Calf	M	414	334	470	110
1	M	101	678	860	500
2	M	102	1,015	1,400	660
3	M	63	1,277	1,590	1,275
4	M	46	1,431	1,800	990
5	M	39	1,626	1,870	1,415
6	M	38	1,677	1,930	1,224
7	M	17	1,739	1,900	1,535
8	M	14	1,719	1,860	1,540
9	M	12	1,739	1,980	1,640
10	M	2	1,755	1,920	1,750
11	M	None	--	--	--
12	M	None	--	--	--
13	M	None	--	--	--
14	M	2	1,545	1,550	1,540
15	M	1	1,460	--	--
Calf	F	424	316	420	110
1	F	45	597	715	460
2	F	65	828	1,020	650
3	F	77	889	1,070	740
4	F	59	933	1,110	760
5	F	35	936	1,090	700
6	F	44	969	1,140	695
7	F	34	1,007	1,160	915
8	F	16	1,026	1,180	980
9	F	18	999	1,120	820
10	F	5	993	1,075	830
11	F	1	1,060	--	--
12	F	3	1,028	1,150	930
13	F	3	1,085	1,205	1,010
14	F	None	--	--	--
15	F	1	1,180	--	--

When interpreting the data shown in Table II, it would be well to remember that these weights, at least for the bulls, undoubtedly do not represent their greatest weight during the year. The weights were all taken during October, following the rut. We know from a very limited weight loss study in 1963, that the adult bulls, those four years of age and older, lose a considerable amount of weight during the breeding season. In that year, seven bulls were captured prior to the breeding season, weighed, and specially marked for later identification. Table III, on the following page, summarizes our findings.

TABLE III: BUFFALO WEIGHT LOSS STUDY, 1963

<u>Age</u>	<u>Weight on July 17</u>	<u>Weight on October 8</u>	<u>Pound Loss</u>	<u>Percent Loss</u>
3	1,230	1,220	10	.8
4	1,710	1,590	120	7.5
4	1,545	1,380	165	12.0
5	1,750	1,525	225	14.8
5	1,950	1,690	260	15.4
6	1,820	1,600	220	13.8
7	1,965	1,780	185	10.4

It should be appreciated that by the time of the second weighing, these animals would have had the opportunity to recover some of the weight lost, as the breeding season is practically over by the end of August. Thus the figures shown undoubtedly do not represent the total weight lost during this period. On this basis, we can safely assume that the 1,900 pound bulls shown in Table II weighed over 2,000 pounds prior to the rut.

The butcher herd was brought down to the slaughterhouse from the Sheep Pasture on November 26. Butchering commenced on November 29, and was completed in ten days. A total of 131 buffalo was disposed of during the year. Thirty-four long yearlings, including five bulls and twenty-nine heifers, were sold alive, three two-year-olds were transferred to the Charles M. Russell Range, and ninety-four were butchered. With natural losses, the 1965 herd reduction amounted to 147 animals, which exceeded our authorized disposal quota of 135 by 12 animals. There were several reasons for this. At the time we computed our disposal quota for sales purposes, we had had only eleven natural losses. Also, at that time, we had inadvertently not counted the three live animals destined for Fort Peck in our disposal. Thus, we had calculated our total disposal prior to October 1 as 138, or only three more than authorized. With five additional losses recorded during and subsequent to roundup, plus the three live transferrees, and one additional animal butchered to replace a two-year-old heifer in the butcher herd that was badly gored, our disposal totaled 147 (the hind quarters from the gored heifer were unfit for allocation to meat applicants and were sold for the best price obtainable). As a result, we have achieved an over-all reduction in our herd which had originally been scheduled over a two-year period. We are now carrying slightly less than the 300 animal units recommended by Soil Conservation Service Range Specialist, Robert Ross, following his 1964 range site and condition study. Mr. Ross' survey and recommendations are discussed under Section V, Field Investigation.

All cows in the butcher herd were examined to determine whether they were pregnant and/or lactating. This information,

and similar data collected during disposals from 1951 to the present, is summarized in the following two tables:

TABLE IV: PREGNANCY AND LACTATION RECORD, 1965

<u>Age Group</u>	<u>Number Examined</u>	<u>Percent Pregnant</u>	<u>Percent Lactating</u>
1	1	0	0
2	13	85	8
3	6	83	83
4	8	100	87
5	3	100	100
6	2	100	100
7	6	100	100
8	1	100	100
9	1	100	100
12	1	0	0
13	<u>1</u>	<u>100</u>	<u>100</u>
Overall	43	88	63

It will be noted that the percentage of animals lactating is down considerably from 1964. This is due to the fact that one yearling was inadvertently identified as a two-year-old and butchered, and an unusually large number of two-year-olds were butchered.

TABLE V: PREGNANCY AND LACTATION RECORD, 1951 - 1965

<u>Year</u>	<u>Number Examined</u>	<u>Percent Pregnant</u>	<u>Percent Lactating</u>
1951	25	60	68
1952	22	63	50
1953	14	57	43
1954	19	84	74
1955	24	87	54
1956	17	82	82
1957	19	94	63
1958	24	96	75
1959	19	89	74
1960	24	88	49
1961	19	100	95
1962	25	100	76
1963	16	94	69
1964	37	89	78
1965	<u>43</u>	<u>88</u>	<u>63</u>
Overall	347	85	67

The reason that the pregnancy percentage is generally lower than the actual production percentage was discussed in the 1964 Narrative Report.

The live and dressed weight records maintained during the butchering program are summarized in the following table:

TABLE VI: AVERAGE LIVE AND DRESSED WEIGHTS, 1965

<u>Age</u>	<u>Sex</u>	<u>Number</u>	<u>Average Live Weight</u>	<u>Average Dressed Weight</u>	<u>Percent of Live Weight</u>
2	M	24	941	517	54.9
3	M	13	1,148	626	54.5
4	M	1	1,200	624	52.0
5	M	3	1,528	834	54.6
6	M	1	1,470	806	54.8
7	M	1	1,800	1,061	58.9
8	M	1	1,550	870	56.1
10	M	1	1,750	1,012	57.8
<u>Av. for 45 Males</u>			1,108	582	52.5
2	F	11	757	434	57.3
3	F	4	857	436	50.9
4	F	8	842	464	55.1
5	F	2	795	413	52.0
6	F	3	867	481	55.5
7	F	5	869	475	54.7
8	F	1	960	481	50.1
9	F	1	1,000	586	58.6
12	F	1	840	469	55.8
13	F	1	910	475	52.2
<u>Av. for 37 Females</u>			831	456	54.9
<u>Total Average</u>			983	525	53.4

Certain measurements (in inches) were taken for the tenth year during butchering and are consolidated in Table VII on page 14.

A total of 51,196 pounds, or 25.6 tons of dressed buffalo meat was either shipped or delivered to customers at the slaughter house during the 1965 disposal program. This is 4.4 tons more than was butchered in 1964. Table VIII, on page 15, lists the average weights of 233 quarters of meat which were weighed individually before shipping or delivery.

Another buffalo with a pure white tongue was butchered this year. According to our records, this is only the second time a white tongue has been found in the Bison Range herd. As indicated in the 1964 Narrative Report, we do know that our herd carries a recessive albino gene, from past records of albinism, and we're not particularly surprised when evidence of this trait is found.

TABLE VII: MEASUREMENTS TAKEN AT BUFFALO SLAUGHTER, 1956 - 1965

<u>Age</u>	<u>Sex</u>	<u>No. Animals Represented</u>	<u>Total Length</u>	<u>Height at Shoulders</u>	<u>Length of Hind Foot</u>	<u>Length of Tail</u>	<u>Length of Ear</u>
2	M	123	110.0	61.6	23.1	16.0	5.4
3	M	57	116.8	64.3	23.1	16.5	5.5
4	M	27	126.0	65.6	24.5	16.5	5.7
5	M	21	124.2	67.9	23.7	16.9	5.9
6	M	13	122.7	67.7	23.7	17.1	5.8
7	M	18	126.9	69.2	24.2	17.4	5.9
8	M	15	126.0	67.4	24.7	17.6	5.9
9	M	15	127.3	69.5	24.5	16.6	5.8
10	M	1	101.0	58.5	20.5	15.5	5.5
1	F	1	99.0	57.0	21.0	15.0	5.2
2	F	15	100.9	57.2	20.7*	14.7	5.2
3	F	23	105.2	58.5	21.4	15.1	5.3
4	F	29	107.3	58.3	21.4	14.7	5.4
5	F	19	105.9	58.6	21.7	15.5	5.5
6	F	23	106.5	58.7	21.5	15.4	5.4
7	F	24	107.6	58.8	20.6	14.6	5.3
8	F	27	107.1	58.2	22.1	15.5	5.3
9	F	10	115.1	58.8	22.8	15.7	5.4
12	F	1	103.0	62.0	19.0	12.5	5.2
13	F	1	110.0	63.0	21.5	15.0	5.5

* The length of hind foot measurement for the 2-year-old female class is based on a sample of 13 animals.

TABLE VIII: SUMMARY OF DRESSED QUARTER WEIGHTS, 1965

<u>Age</u>	<u>Sex</u>	<u>Number of Quarters Represented</u>	<u>Average Weight</u>	
			<u>Front</u>	<u>Hind</u>
2	M	38	138#	116#
3	M	21	176	139
4	M	3	191	140
5	M	3	251	162
7	M	1	325	200
1	F	2	93	90
2	F	20	114	103
3	F	6	113	97
4	F	16	122	106
5	F	5	111	99
6	F	5	126	110
7	F	8	120	104
8	F	2	127	113
12	F	1	140	114
13	F	1	132	101

2. Elk

A total of 59 elk was observed during the annual big game census on February 27. This number was believed to represent our total range population, with seven additional elk in the exhibition pasture.

An estimated 19 calves were born during 1965. Fifteen were observed with a group of 42 adult elk on June 30, two newborn calves were seen on the range during September and October, and two calves were born in the exhibition pasture.

Twenty adult animals were taken during the disposal program. Two adult bulls were transferred to the Fort Niobrara Refuge on May 5. One adult bull, Tommy II, and two adult cows were donated to the Montana Department of Fish and Game for exhibition at the New York World's Fair.

Elk found dead included three newborn calves, one adult cow and one yearling bull. Cause of death could not be determined on the calves and cow. A yearling bull, born in the exhibition pasture in October 1964, was found dead on September 8. Necropsy was performed by R. C. Keyser, D.V.M., Ronan, and his diagnosis was "Chronic pneumonia and internal parasites, leading to a debilitated condition and malnourishment." Dr. Keyser felt the primary cause of death was the calf's misfortune to have been born in October, and the subsequent lack of adequate nourishment during the early period of growth.

The cows in our exhibition pasture (and apparently a few on the range) are remnants of a group of elk used for study purposes, during the period 1951 through 1956, by graduate students of the University of Montana. The cows were penned up with vasectomized bulls for studies relating to elk reproduction. So-called "intact" bulls were turned in with the cows at odd times of the year, and the cows began calving during the late summer and early fall months. Cows retained after the studies were completed, continued to calve during this period and, according to what records we have, most of their offspring died within one to two years following parturition. Apparently, the elk, unlike most species of big game animals, is unable to correct a breeding cycle that has been artificially disrupted. The cows have been run with one or more bulls almost continually since 1956. We have separated our display bull from the cows and hope to have their estrus cycle back on schedule by next fall.

Total losses amounted to 30 animals, for a net loss of 11 animals, or a balance of approximately 55 head at the end of the year.

The main elk herd has characteristically spent almost the entire year in the timbered and adjacent grassland areas in the Upper West Range. A few animals ranged into the Sheep Pasture,

Elk Creek and onto Headquarters Ridge for short periods of time. A small group of elk frequented Mission Creek during the summer months and were occasionally observed during the daily conducted tours.

A summary of dressed weights taken on the 20 head of elk killed during disposal is given below:

TABLE IX: DRESSED WEIGHTS OF ELK, 1965

<u>Age</u>	<u>Sex</u>	<u>No. Animals Weighed</u>	<u>Average Dressed Weight</u>	<u>Extremes</u>	
				<u>Largest</u>	<u>Smallest</u>
1.5	M	2	252	254	251
3.5	M	1	331	--	--
4.5	M	2	403	433	373
12+	M	1	270	--	--
1.5	F	6	237	293	209
2.5	F	1	311	--	--
3.5	F	2	254	262	246
4.5	F	3	281	297	265
5.5	F	1	282	--	--
6.5	F	1	259	--	--

A bull elk was trapped in the Elk Lane on May 30 to replace Tommy II. The bull was about a four-year-old, and made an excellent addition to our headquarters display group. The display herd now consists of 1 bull, two cows, 1 yearling and two calves, which were born on October 9 and 11. The yearling was born in the pasture during August 1964 and is obviously not in good physical condition. The continued maintenance of this type of animal in the exhibition area constitutes a rather poor advertisement. We are providing these elk with a supplemental diet of grain, pellets, etc., in hopes of bringing the calves through the winter in reasonably good condition, but will plan to remove the yearling during next year's disposal program.

3. Mule Deer

We have an estimated 200 head of mule deer on the refuge at the end of the year. Production was estimated at 100 animals; however, with disposal and natural losses, our population remains at about 200 animals.

A total of 96 muleys was taken during disposal, a substantial increase over the 37 removed in 1964. One adult doe was collected for Dr. Phillip Wright, Zoologist, University of Montana, for class demonstration purposes, and three animals were found dead (or shot, as in the case of the old tame buck, "Phantom") for a total herd reduction of 100 animals, the desired disposal quota established earlier. The "Phantom" declined rapidly during the summer months, until September 15, when he was found lying near the pumphouse, frothing at the mouth with convulsive neck and head

movements. He was twelve years old this year, and Dr. Keyser had previously indicated that he was beyond help, so he was destroyed.

The tables found on page 19 give the weight relationships of a sample of animals weighed during the 1965 disposal program, and a summary of weights obtained during the period 1952 to 1965.

4. White-tailed Deer

The earliest white-tail fawn was noted on June 1. Total production was estimated at 65 head. With six known losses from natural or other related causes, our population estimate at the close of the year is 175 animals, or a net gain (on paper at least) of about 15 animals for the year. Four of the six losses were adults, and two were fawns. One adult doe was shot illegally in the picnic area during December, which will be discussed under Section VI. E. Violations, and one fawn died as a result of an accident. Cause of death on the remaining animals could not be determined. The fawn was found paralyzed near a fence in the picnic area on October 1. It was examined and later autopsied by Dr. Keyser, who confirmed that death had been accidental. The deer had apparently jumped into the fence and broken its back.

A total of 41 white-tails was removed during disposal activities this fall. This fell far short of our desired removal quota of 75, however, the wiley white-tail proved to be too smart for us. The disposal program was terminated on December 17, when it was felt impractical and economically infeasible to continue hunting any longer. Slightly more than one-half of the deer taken were weighed. This information, and the weight records accumulated since 1955, is summarized on the table on page 20.

5. Bighorn Sheep

Sheep production, totaling eight lambs, was excellent this year, considering that no lambs were recorded in 1964. One ewe noted on July 16 appeared to the observer to be a yearling; however, this observation was never confirmed. No known losses of adult sheep occurred and, as far as we know, all eight lambs survived the year.

Our bighorn population is estimated to number 48 animals at the end of the year.

6. Antelope

The prolific Bison Range antelope herd has continued to thrive. The population at the beginning of the year was estimated at 118 head. An aerial census on July 23 revealed a total of 160 animals, with age and sex composition as follows; adult bucks--36, adult does--68, kids--56. Utilizing 1964 population figures, the doe:kid ratio was computed as 1:1.1. To arrive at a does:kid ratio, it was necessary to assume that the 1964 fawn crop was comprised

TABLE X: AVERAGE WEIGHTS AND WEIGHT RELATIONSHIPS OF ROCKY MOUNTAIN MULE DEER

Disposal Season, 1965

Age Class	Sex	No. Samples Represented	Average Whole Weight	Average Hog-dressed Weight	Average Dressed Weight	Average Visceral Weight	Percent of Total Weight		
							Hog-dressed	Dressed	Visceral
1½-2½ Yrs.	M	5	152.0	121.6	88.6	30.4	80.0	58.3	20.0
3½-4½ Yrs.	M	1	210.0	175.0	133.0	35.0	83.3	63.3	16.7
1½-2½ Yrs.	F	10	137.8	106.5	82.3	31.3	77.3	59.7	22.7
3½-4½ Yrs.	F	6	165.5	132.5	95.8	33.0	80.1	57.9	19.9
5½-10 Yrs.	F	4	185.0	143.7	107.2	41.2	77.7	58.0	22.3
Total Samples		26							

AVERAGE WEIGHTS AND WEIGHT RELATIONSHIPS OF ROCKY MOUNTAIN MULE DEER

Disposal Seasons 1952 - 1965

1½-2½ Yrs.	M	197	143.5	109.1	85.5	34.8	76.0	59.6	24.2
3½-4½ Yrs.	M	132	194.3	157.4	120.4	39.4	81.0	61.9	20.2
5½-10 Yrs.	M	35	218.3	173.3	138.0	44.6	79.4	63.2	20.4
1½-2½ Yrs.	F	142	129.6	98.8	78.9	31.2	76.2	60.8	24.1
3½-4½ Yrs.	F	136	143.5	107.6	84.2	36.0	75.0	58.7	25.0
5½-10 Yrs.	F	36	154.4	114.2	90.2	39.0	73.9	58.4	25.2
Total Samples		678							

TABLE XI: AVERAGE WEIGHTS AND WEIGHT RELATIONSHIPS OF WHITE-TAILED DEER

Disposal Season - 1965

Age Class	Sex	No. Samples Represented	Average Whole Weight	Average Hog-dressed Weight	Average Dressed Weight	Average Visceral Weight	Percent of Total Weight		
							Hog-dressed	Dressed	Visceral
1½-2½ Yrs.	M	7	136.4	107.8	79.0	28.6	79.0	57.9	20.9
3½-4½ Yrs.	M	2	184.0	157.5	110.5	26.5	85.6	60.0	14.4
1½-2½ Yrs.	F	4	121.2	90.0	68.0	31.2	74.2	56.1	25.8
3½-4½ Yrs.	F	4	143.7	110.0	80.5	33.7	76.5	56.0	23.5
5½-10 Yrs.	F	2	125.0	82.5	62.5	42.5	66.0	50.0	34.0
Total Samples		19							

AVERAGE WEIGHTS AND WEIGHT RELATIONSHIPS OF WHITE-TAILED DEER

Disposal Seasons, 1955 - 1965

1½-2½ Yrs.	M	88	134.6	101.5	80.9	32.9	75.5	60.1	24.5
3½-4½ Yrs.	M	67	175.1	143.5	113.2	31.6	82.0	64.7	18.1
5½-10 Yrs.	M	17	196.4	159.7	124.9	36.7	81.3	63.6	18.7
1½-2½ Yrs.	F	57	116.5	84.3	67.9	32.3	72.3	58.3	27.7
3½-4½ Yrs.	F	47	143.2	96.3	69.7	47.1	67.2	48.7	32.8
5½-10 Yrs.	F	11	140.0	104.1	71.8	35.8	74.4	58.5	25.6
Over 10 Yrs.	F	1	145.0	105.0	80.0	40.0	72.4	55.2	27.6
Total Samples		288							

of a 50:50 ratio of males to females, so the figure may not be entirely accurate.

We again made arrangements with the Montana State Department of Fish and Game for a cooperative trapping and transplanting program for the removal of surplus antelope. The trapping operations commenced on October 27, under the direction of Jim McLucas, Montana State Fish and Game Department, and were completed on October 28. A total of 59 animals was trapped with the aid of a helicopter. An adult doe broke a front leg while being run with the copter and had to be destroyed. One adult buck was found dead in the trap the morning after roundup. One doe escaped from the trap, and one kid, previously ear-tagged for study purposes by Peter Bromley, was released. A total of 55 antelope was loaded out for shipment to Arizona on October 28, and included 26 adult females, 8 immature females, 19 adult males and 2 immature males. When the first attempt to trap the main herd failed, most of the fawns lost their fear of the copter and refused to be driven. Consequently, we were unable to trap as many fawns as we had hoped.

A total of twelve adult female antelope was collected for University of Montana graduate student, B. W. O'Gara's study relating to antelope reproductive physiology. One adult female was collected for Dr. William Longhorst, University of California, Hopland Field Station, Hopland, California, for research purposes (material also utilized from this animal by O'Gara). There were four additional known losses during the year. The cause of death could not be determined on these animals, although a yearling found dead on November 4 may have died from injuries sustained during the antelope roundup.

Assuming our records are complete, composition of the refuge herd at the close of the year was as follows: thirteen adult males, twenty-eight adult females, and forty-six fawns, or a total of 87 animals - plus one adult doe in the headquarters exhibition pasture.

Twelve adult females are to be collected between January and April of 1966 for Mr. O'Gara's study. This will give us a balance of 17 does of breeding age next summer. Our total population at that time, barring any unforeseen losses, will be 76 animals. A total of 75 animals has been somewhat arbitrarily established as the desirable pre-fawning refuge population. Although we are maintaining our theoretically desirable population level, we had hoped to reduce antelope numbers to a greater extent than we did. Given the reproductive rate of this herd, and the reproductive potential of the remaining breeding-age does, we may expect an over-abundance of animals next year. Unfortunately, we will not have a sufficient surplus to justify the costs of a trapping program until the fall of 1967. We shall give serious thought to reducing the pre-fawning population to 60 or, possibly, 50 animals in 1967, if the desired sex and age ratios can be maintained.

7. Rocky Mountain Goats

The current status of our goat population is somewhat in doubt. We know that we have four animals, the number that was introduced on May 22, 1964, but we don't know whether these represent the original four. A goat observed on November 3 appeared to be a yearling. The original introduction included one 2-year old male, two 2 to 3-year old females and a yearling female. One of the older females was ready to give birth when she was released, but the kid was presumed lost, as it was never seen. It now appears that the kid may have survived and that we may have a total of five goats. Unfortunately, we have never seen more than three of these animals together at any one time. Based on observations made during deer and elk disposal, we can only be sure that we have four animals, including the one believed to be a yearling.

The four mountain goats serve no useful purpose at the present time. They are never seen by the visiting public and are only rarely observed by refuge personnel. Before they can be considered of significant value to anyone, they will have to be allowed to increase their numbers considerably. We are reluctant to permit an increase until we learn more about managing the big game species we already have. We have insufficient knowledge of food habits, forage requirements, and the degree of forage competition which exists between the various species to manage them properly. As a result, population levels of the secondary big game species have thus far been established somewhat arbitrarily.

8. Longhorn Steers

The longhorn exhibition herd remains at four animals. The two steers acquired from the Wichita Mountains Refuge last year have done extremely well and add considerably to the display group. The old longhorns, Tom and Jerry, remained in good physical condition, but Tom's lameness appears to be somewhat worse than it was last year.

9. Black Bear

We believe that black bear occur on the Bison Range as transients only. One bear was observed on February 27, and an animal thought to be a bear was seen near Highpoint on November 4. No evidence of bears denning up on the refuge has ever been found.

D. Fur Animals, Predators, Rodents and other Mammals

Coyotes are seen occasionally, but were not common. Six of these animals were observed on February 27. One was found dead in the Amphitheater on April 14. The coyotes are far too scarce to cause any significant problem. In fact, we miss their spine-tingling howling. Coyotes were heard only once during the entire year.

Bobcats remained relatively uncommon. They were seen on only five occasions during the year. An adult 'cat and a kitten were seen together near the Mission Creek bridge at headquarters on August 19. They were definitely not a problem.

There were no dogs seen on the range this year, but evidence indicating that they were running inside the boundary was found in abundance during the late fall and winter months. From all indications, the dogs were coming from the vicinity of the Flathead Agency. Agency Superintendent P. T. LaBrecche extended his full cooperation in curbing this activity. A small pup of the "Hines 57" variety wandered into the headquarters area in October. He was later relocated to a home near Charlo.

Our feral house cat population consisted of two animals, one of which took up residence at headquarters. He has thus far successfully evaded the hunters.

Only three badgers were observed during the year, and badger holes were less common than in previous years. One large adult badger was seen crossing the bridge at headquarters on June 26.

Skunks remained quite common, particularly along Mission Creek near headquarters. Several were destroyed around the headquarters area.

Several long-tailed weasels were reported during the year, but this species was not particularly abundant. One was found dead in the headquarters barn.

Porcupines were seen occasionally, but were not common. Porcupine quills were removed from a buffalo cow's face in April. Four "porkies" were destroyed during the year.

Yellowbelly Marmot colonies were again present at the Snake Pit and in the headquarters bone yard. Three animals were also observed near the south boundary road on the Jocko.

Mountain cottontails were seen on the range occasionally, and were more common around headquarters during the winter periods than in recent years.

Columbian ground squirrels were first noted on March 31 this year. Colonies were present in the east buffalo display pasture and on the tour road east of Highpoint.

Yellow pine chipmunks were seen occasionally in the picnic area during the summer months.

Evidence of pocket gopher activity is common, but total numbers are believed to be rather low.

The die-off in meadow mice which occurred during the spring of 1964 has been followed by a gradual increase in numbers. Mouse activity became increasingly more apparent during the latter portion of 1965.

Three beavers were seen on Mission Creek in July, but are not at all common. A great deal of beaver activity existed just east of the refuge boundary on Mission Creek.

Muskrats are also seen occasionally along Mission Creek.

A crew of men working along Mission Creek in March saw three mink over a period of several days. These animals are rarely observed on the refuge, but are probably more common along the main water courses than we realize.

Little brown myotis' were quite common around headquarters and along Mission Creek during June and July.

E. Hawks, Eagles, Owls, Crows, Ravens and Magpies

Representatives of this group of birds were generally present in normal numbers during the year, although magpies were more abundant than they have been for several years.

The sparrow hawks were our most abundant hawks, and were commonly observed in groups of from 10 to 20 birds. A total of 77 was counted during the guided tour on August 28. Two nestlings were banded on July 19.

Marsh hawks were common, and prairie falcons and red-tailed hawks were observed occasionally.

Two ospreys were observed, one on Mission Creek during June, and one along the Jocko River in November.

Golden eagles appeared to be considerably more common than in previous years. Five separate birds were observed on July 3.

Bald eagles are quite common on the reservoirs in the Flat-head Valley, particularly during the winter months, but are only occasionally seen on the Bison Range. Four were observed on Mission Creek on April 12, and one was seen near headquarters on October 7.

Great-horned, long-eared and short-eared owls were seen occasionally along Mission Creek, with the great-horned owl the most abundant of the three.

No burrowing owls were recorded, but one pygmy owl was banded at headquarters on October 24.

Both the crow and raven were observed occasionally, but were not abundant.

F. Other Birds

Small birds were generally quite abundant throughout the range this year, although mountain bluebird numbers appeared to be declining, with less seen than in any previous year. This gradual decline has been accompanied by a corresponding increase in the starling population. Many nest sites previously used by bluebirds in the headquarters area were occupied this summer by starlings. We feel reasonably sure that the aggressive nature of the starling has been an important factor in the decline or displacement of bluebirds.

The Clark's nutcracker and Lewis' woodpecker were the most commonly observed species in the conifer areas at higher elevations.

Principal species noted at lower elevations and around headquarters were; the common nighthawk, hairy and/or downy woodpecker, Eastern and Western kingbird, Western wood pewee, horned lark, violet-green, tree, bank, rough-winged, barn and cliff swallows, red-breasted nuthatch, house wren, robin, cedar waxwing, northern shrike, yellow warbler, yellowthroat, Wilson's warbler, house sparrow, Western meadowlark, redwinged blackbird, Bullock's oriole, Western tanager, lazuli bunting, American goldfinch, vesper sparrow, Oregon junco, chipping sparrow, white-crowned sparrow, song sparrow, snow bunting, English sparrow, etc.

A partial albino robin was seen in the picnic area on May 24. This may be the same bird observed at headquarters on May 21, 1964.

A banding program utilizing mist nets was initiated in June for small birds, but far less time was devoted to this project than we had hoped. A total of 92 individuals of twenty-two species was banded. Such banding work, on a continuing basis, will give us some interesting information regarding seasonal occurrence, abundance, sex ratios, etc.

G. Fish

Nothing to report.

H. Reptiles and Amphibians

Rattlesnakes were either more abundant this year, or more noticeable. A total of twenty rattlers was removed during the year, considerably more than usual. Most of them were taken on the tour road, and four were found in the headquarters display area. One of these was an 8" baby that was first discovered when it was stepped on by the Manager's three-year-old son. Fortunately, the boy's eight-year-old sister pulled him away from the snake before it could strike. It was subsequently dispatched, along with several acres of excellent lawn grass, by the boy's hoe-wielding mother.

Painted turtles were commonly seen along Mission Creek, and one very interesting observation was made of a female in the act of depositing eggs in a hole just north of the headquarters barn.

Amphibians observed occasionally included the slender-toed salamander and tree frog.

I. Diseases

Blood samples were taken from 93 buffalo, 101 deer, 12 elk and one antelope. These samples were tested for the presence of antibodies for brucellosis, and also, in the case of buffalo, for Leptospirosis pomona. All samples tested negative for brucellosis, except one two-and-a-half-year-old white-tailed buck, which was classified as "suspicious". Dr. Corcoran advised that this classification is not cause for concern, as a so-called "suspicious" test reaction may occasionally result from the method of testing rather than from the sample itself.

Of the 93 buffalo blood samples tested for Leptospirosis, 78 were negative, 7 were suspects, and 8 were reactors. This merely confirms what we already know, that Lepto is present in our herd, and periodically manifests itself either in the form of infected blood samples or abortions.

The tick population was down considerably from the unusual high level noted in 1964. No known disease resulted from the presence of this ectoparasite. Ticks were collected from four horses, one buffalo and two deer, and submitted to the U.S.D.A., Animal Disease Eradication Division, Helena, Montana for identification. The specimens from the horses, buffalo and one deer were identified as Dermacentor venustus Banks = 's (Dermacentor andersoni) Stiles, Rocky Mountain wood tick. The "tick" collected from the flank of the second deer was identified as Lipoptena depressa, or louse fly of deer.

As mentioned earlier under Buffalo, we experienced an unusually high loss in our buffalo herd for the second consecutive year. There were eleven known losses in 1964, and sixteen losses in 1965. These deaths represent, proportionally, perhaps the greatest annual losses in the history of the Bison Range. From our work with dead and sick animals this year, it is now apparent that we have a disease organism in our herd which can cause serious losses and which was previously unknown to us. For this reason, we shall discuss our losses and sickness in greater detail in the following summary than we normally would:

June 2 - Two to three-month-old calf was found dead near the division fence in Lower West Range. Stage of decomposition was too advanced for determination of cause of death.

June 29 - Yearling heifer found dead at the edge of the watering pond in Upper Trisky Creek. Animal appeared to be in good flesh and

showed no evidence of exterior abnormalities or injury. Stage of decomposition too advanced for necropsy. Cause of death unknown.

August 25 - Two-year-old bull found dead above contour fence between headquarters and slaughterhouse. Very fine bull in excellent flesh. Evidence of scours and much restlessness preceding death. No evidence of external abnormalities or injury. Decomposition too advanced for necropsy. Cause of death unknown.

September 1 - Seven-year-old bull found dead near Indian Springs, above contour fence. Animal was badly decomposed and cause of death could not be determined.

September 2 - Three or four-month-old heifer calf found dead just below slaughterhouse near tour road. It was a very large calf in excellent flesh. There was evidence of external bleeding from small hole behind right front shoulder. Upon examination, a large "blood-shot" area was found beneath the skin. Decomposition was too advanced for further necropsy. Cause of death was believed to have been an injury, most likely a horn wound.

September 7 - Fourteen-year-old bull found dead in lower Trisky Creek. The rear portion of the bull's body was submerged in a watering hole. The animal was badly decomposed and cause of death could not be determined.

September 7 - Three-month-old bull calf found dead in the head of Trisky Creek. The carcass still contained a considerable amount of body heat when found. There was no indication of abnormalities or injury. The calf was in excellent condition. Two riders had ridden through this area on horseback earlier on the same day and had "spooked" a bunch of buffalo near where the calf was found. It appeared possible that the calf may have been run over by the larger animals during the rush. The calf was examined by refuge personnel, and the neck appeared to be broken.

September 7 - Two riders on horseback located a badly crippled, three to four-month-old heifer calf between the upper Trisky gate and Indian Springs. When approached, the calf stumbled repeatedly and fell to the ground several times. Swelling of the hock joints was evident. The men didn't have a rope with them and the calf had sufficient strength to avoid being caught on foot. When the calf was approached the following morning, its condition was much worse. It could run only a short distance before stumbling and falling, and two men were able to catch and hog-tie it on foot. The calf was brought into the corrals for treatment, but died about one-half hour later.

It was at this point that we made arrangements with the U.S. Public Health Service, Rocky Mountain Laboratory, Hamilton, for diagnostic work. The Hamilton Lab. is basically a research facility and normally does not provide this type of service. They consented to work with us on our disease problems until the cause of our losses

could be determined and a course of treatment successfully adopted. Their assistance was requested primarily because we felt they would provide us with more thorough diagnostic information than that previously received from the State Livestock Sanitary Control Board laboratory in Bozeman, and because the Hamilton Lab. is more conveniently located.

The calf, which died at the corrals on September 7, was taken to the Hamilton Laboratory for necropsy on September 8. The autopsy report from William L. Jellison, Parasitologist, dated September 9, read as follows:

"No evidence was found of gross mechanical injury or wound that would account for death. No foreign body, i.e. nails or wire were found in the digestive tract. The feet were free of wounds and infection as far as could be determined.

"As you had already observed, the knee and hock joints on the right side were considerably swollen. When these were examined the joint cavity was found to contain an excessive amount of yellowish, gelatinous to fibrinous material. This extended along the tendon sheaths. The joints on the left leg were nearly normal, although one contained abnormal synovial fluid.

"The only other significant lesion was an enlarged necrotic area about the size of a walnut in the roof of the pharynx on the right side. No foreign body, i.e. nail, wire or grass awns could be demonstrated in this area.

"One prescapular lymph node was enlarged and had necrotic areas in the cortex.

"There were many bruises on the animal probably as a result of its helpless condition, numerous falls or handling. There were many areas of diffuse hemorrhage on the surface of the heart and in the endocardium. Hemorrhage was also present on the peritoneum and in the lungs indicating a terminal septicemia.

"There were no massive accumulations of pus or caseous material that would be suggestive of caseous lymphadenitis which we have observed quite often in game animals. The umbilical area appeared normal. Liver, spleen and kidneys were apparently normal. Apart from scattered hemorrhages, the lungs were normal.

"Cultures have been made from prescapular node and from synovia fluid and exudate. An organism has been isolated from both sources but is not yet determined. It is not a Corynebacterium but is a very small gram negative coccobacillus. If identification is made on the organism, it will be reported.

"Diagnosis: Acute arthritis with septicemia.

"Autopsy made by Dr. William Hadlow, Dr. Cora Owen and Dr. William Jellison. Follow up bacteriological work is being done by Dr. Cora Owen."

On September 13, Dr. Jellison wrote again as follows: "Dr. Cora Owen has identified the organism isolated from the young buffalo as Pasteurella multocida. This organism causes haemorrhagic septicemia in cattle and is one of the agents associated with 'shipping fever'. It infects many wild and domestic animals. Human infections are being reported quite frequently.

"We have encountered it previously in a die-off of antelope in Idaho following a big antelope roundup. We do not know of a previous report in buffalo.

"This identification is based on cultural characteristics, microscopic appearance, pathogenicity for mice and agglutination by specific antiserum. An abundant growth of the organism appeared on cultures from the synovial exudate and from the prescapular lymph node.

"As a further check, cultures are being sent to Dr. John McKiel at Ottawa for verification and typing." We were subsequently advised that Dr. McKiel had verified the identification.

September 13 - Two-year-old bull found dead above contour fence in lower Pauline Creek. We were quite sure this was the same animal that was first sighted on September 6 about one-half mile upstream. At that time the bull was obviously quite ill. He was extremely thin and emaciated, and stood with a "hump" in his back. He walked stiff-legged, and walking appeared to be quite painful for him. The animal was located again on September 7 in the same area. The same symptoms were in evidence, but appeared more pronounced. When we approached to within about 100-feet of him, a strong, putred odor was detected. Fresh feces found where he had been lying down contained tissue-like material and odor of rot or decay extremely strong. Attempted to locate him again on September 8 on horseback, and drive him into the corrals for treatment. The bull could not be located and was not seen again until found dead. Dr. Keyser conducted post-mortem in evening as decomposition was too advanced for submission to Hamilton Lab. His necropsy report was as follows:

"Weak yearling bull died approximately 36 hours before necropsy, sometime on September 12. Post-mortem disclosed anterior thoracic abcess, ventral, about 9"x6"x48, but due to autolysis could not tell if this originated in the lung. Bruising and horn wounds found on the animal did not appear to be directly linked with cause of death." Dr. Keyser's diagnosis was that, "Death was caused by bacterial infection in form of abscess in ventral anterior thoracic cavity 12x8x6 CM. Putrefied to a degree that prevented determination of this as to internal or pulmonary type."

Tissue samples were submitted to the Hamilton Lab. through the Montana Livestock Sanitary Board. Their report stated that, "Specimen not cultured directly because of condition. Mice inoculated intraperitoneally with triturate of specimen dead in less than 20 hours. Cultures of peritoneal fluids yielded cultures of organism morphologically and culturally Pasteurella multocida. Diagnosis: Pasteurella multocida infection."

September 12 - Three to four-month-old bull calf found dead in east display pasture at headquarters. When found and examined by refuge personnel, calf had only been dead a few hours, was in excellent physical condition, but showed moderate swelling of legs, particularly the hock joints. Dr. Keyser was called, and necropsy was performed within an hour after the calf was found. The calf was not taken to Hamilton because the day on which it died was a Sunday. Tissue samples were sent to the Hamilton Lab., however. Their report, containing a more complete necropsy report from Dr. Keyser, was as follows:

"Disease suspected - Spherophorus ???? Necropsy - Externally no lesions except very minor skin punctures or two on lower legs. Internal: General condition excellent. Abdominal cavity contained about one pint serous fluid, with diffuse fibrinous clots around intestine. Hemorrhagic area suggested puncture or rupture of gut, but unable to find the hole in bowel, and no injury to abdominal wall. Intestinal lymph nodes swollen and guy content appears to indicate enteritis complex. Laboratory findings: Since all organs in same jar (Dr. Keyser's techniques have since improved), no attempt made to do direct cultures. Specimens still cold. Mice inoculated intraperitoneally 14 Sept. with triturates of liver, kidney and node, all dead 15 Sept. - less than 20 hours after inoculation. Smears of peritoneal fluids: very abundant tiny Gram-negative coccobacilli; some with bipolar staining. Cultures of peritoneal fluids: abundant growth of shiny whitish colonies with musty odor. Tiny Gram-negative coccobacilli in pure cultures. Sensitive to penicillin. Differential biochemical tests typical of Pasteurella multocida. Diagnosis: Pasteurella multocida infection - widespread throughout body."

It should be noted that this calf was born in the display pasture and had been under more or less continuous observation by numerous people every day since its birth. No indication of illness or lameness was observed prior to death, indicating that the infection apparently increased to a virulent level rather rapidly.

September 13 - Lamé heifer calf was found in lower Elk Creek. Extreme swelling of legs and hock joints was evident, and the calf had obviously lost some weight, although was still in fair condition. Animal had difficulty walking, indicating severe pain in legs, and was found alone, some distance from the nearest group of buffalo. It apparently was unable to keep up with the herd and had lagged behind. Surprisingly enough, when approached, the calf was able to run quite well and refuge personnel found it almost impossible to detect lameness. The calf was roped and hog-tied, and brought into headquarters for treatment.

Dr. Keyser examined the calf later in the day. He was unable to diagnose the illness and suggested a battery of drugs in hopes of hitting on one that might prove effective. The calf was given 1.5 gr./# of Sulfabromomathazine, 5cc of Bio-Delta (procaine penicillin in dihydrostreptomycin sulfate solution with prednisolone), and 5cc of long acting penicillin. In addition, 3cc of Bio-Delta were

injected each day for three successive days. Although the animal showed little improvement during the first few days following treatment, the condition didn't get any worse.

Following about one and a half weeks of confinement in the barn, the calf was released to a small fenced enclosure near the display pasture where green grass was available. It gradually gained back much of its strength, but the swelling persisted. By September 23, the calf's condition had improved considerably. The swelling had gone down somewhat, although still persisting, and the calf was strong and quite active. At that time, it was given a 10cc shot of long-acting penicillin and released to the display pasture. The calf's condition improved, although the enlargement of the joints appeared to be permanent and, during roundup, it was moved to a large pasture near the corrals at the slaughterhouse. It was released to the range on November 25, and appeared fully recovered except for the swelling of the hock joints.

September 20 - A lame, 4 to 5-month-old bull calf was found in Alexander Basin, and showed the now typical symptoms of swelling in the joints of the legs. The calf died on the rope, apparently too weak to withstand the stress. The animal was taken to the Hamilton Lab. for autopsy. On September 22, Dr. Jellison wrote as follows: "The buffalo calf, a male, was received in good condition Monday evening, September 20. Autopsy was made immediately by Dr. Owen and me. Results on this animal are not so definite and we are not ready to make a diagnosis. Dr. Owen is continuing cultural and animal inoculation studies and will report to you later. There was no obvious cause of death for the animal."

On September 24, Dr. Owen reported; "Cultures on the bison bull calf received September 20 all yielded Pasteurella multocida, except blood. Tissues tested were blood, liver, spleen, kidney, pericardial fluid, meningeal fluid, axillary and precrural lymph nodes and fluids from both hock joints.

"The most notable points on autopsy were almost completely congested lungs, slightly bloody pericardial fluid and an excessive amount of menigeal fluid. In my opinion, there was so little functional lung tissue that the struggle after it was roped put a further tax on already overburdened respiratory and circulatory systems, resulting in death.

"Thus, we have recovered Pasteurella multocida from all four specimens submitted to us by you and the Montana Livestock Sanitary Board; 1 heifer calf, 2 bull calves and 1 yearling bull.

"I have written Dr. J. A. McKiel in Ottawa asking whether there is a really efficient vaccine but I have not heard yet. Perhaps the best idea would be an autogenous vaccine prepared from your strain. However, the antibiotics instead of sulfas might work."

On September 27, Dr. Owen wrote, "Dr. McKiel writes that, as I feared, he knows of no efficient vaccine against Pasteurella multocida. However, we are going to make an ether-extracted vaccine, such as we make with Francisella tularensis, and to test this for lack of toxicity, efficacy and dosage and, if it should prove to be efficient, for duration of immunity. It may, very possibly, prove to be too toxic for use. If this is so, we will have to consider the problem from another point of view, such as an autogenous vaccine prepared from one of these isolates from the herd.

"It is too late now for us to prepare and test either type of vaccine for efficacy, sterility and lack of side-effects for use in the herd this year. But, if we do find a hopeful preparation, perhaps you would like to try it in some of the young stock next year."

On October 26, Dr. Owen again wrote; "Perhaps you would be interested in our attempts to prepare a vaccine for use in your stock against 'hemorrhagic septicemia'. Immunizing the cows at the time of fall roundup and selection might be easier than trying to catch calves accompanied by irate mothers in the spring and might confer protection on the calves.

"The first method we tried was extraction with aqueous ether. The results were, at first, very encouraging: the product was very strong and completely non-toxic for mice. However, when we tested it for protection of the mice, we might as well have used distilled water. There was no protection whatsoever. There are several other methods we can try and we will do so."

September 20 - A dead buffalo, believed to be a yearling, was found dead below Indian Springs. This animal had been dead a long time, with bones and hide all that remained, and could very possibly have died sometime in 1964 or early in 1965. Cause of death, of course, could not be determined.

September 23 - A lame 5 to 6-month-old bull calf was roped in lower Pauline Creek. The swelling of the joints and legs was very pronounced, and the calf had much difficulty walking. Physical condition was excellent. He was given 10cc of penicillin, color marked for later identification, and released. The calf was alone when found, but was only a quarter of a mile from a small group of buffalo, which he rejoined immediately following release. The calf was subsequently observed on several occasions and appeared to have made a full recovery. This calf was roped around the horns, rather than the neck. He was quite strong and very aggressive. It took three of us to hog-tie him.

September 23 - Two 3 or 4-month-old buffalo calves in the exhibition pasture herd at headquarters were also found to possess swelling symptoms. They were brought in and given 10cc of crystalline penicillin intravenously. We failed to record sex of these two calves.

They apparently made full recovery, as no further evidence of lameness or swelling was noted after about one week following treatment. As a matter of record, rectal temperatures of the two calves were recorded as 107° F. and 107.5° F.

September 30 - A yearling bull with considerable swelling of hock joints and much lameness was brought in to the corrals from the Alexander Basin. The bull was given 10cc of penicillin and released to a fenced enclosure near the slaughterhouse. This bull and the calf brought up from headquarters were kept in this enclosure until November 25. They were released at that time to the range. Both animals appeared quite healthy, although a slight swelling in the hock joints persisted - perhaps permanently.

September 24 - Two 3 to 4-month-old calves, sex unknown, were roped in the Alexander Basin and each given a 10cc injection of penicillin. Both calves showed moderate swelling in legs and hock joints, and lameness. They were color marked for later identification and released. Both were later observed on several occasions and appeared to have made a full recovery.

October 1 - A yearling bull with a swollen left rear hock joint and lameness was located in the Alexander Basin. He was roped by the horns, given a 10cc shot of penicillin, and released. This bull was not color-marked, but lameness in one front shoulder served to identify him. He was later observed on several occasions and appeared to be making a satisfactory recovery.

October 8 - A buckskin calf was found dead just above the Ravalli Ponds. We suspected that it had probably been still-born, as it appeared premature.

October 21 - A large bull in the 4 to 9 age group was found dead in Turkey Woman Draw. It had been dead for some time, and may have died in 1964. Cause of death unknown.

Although our total losses for the year were spread over a period of several months, the majority of them, eleven, with four definitely disease-oriented, occurred during the month of September. This was also the period in which evidence of illness, as manifested by lameness and swelling of the legs and hock joints, occurred. Despite the fact that the cause of death in the majority of these cases could not be determined, we do feel that there was a correlation between the September losses and breeding activities, which terminated during the latter part of August. Many of these animals undoubtedly died from injuries sustained during the rut.

In view of the fact that eight animals, primarily calves, were treated for the now common symptoms of lameness and swelling, the loss of four animals from this disease cannot be minimized. A few observations made during the period in which the losses occurred may be helpful to further analysis of the problem.

At the time of our greatest losses, the herd had the run of the entire range. Losses and evidence of illness did not appear to be confined to any particular area, nor to any particular segment of the herd. The illness was most pronounced in the calves, and the 3 to 4-month-old age group was most frequently afflicted.

No evidence of illness was observed prior to September or subsequent to that month. The incidence of this disease seems to have some correlation with either the season of the year, which may implicate weather and/or forage conditions, or the stage of animal growth. The latter would seem refuted by the occurrence of symptoms in the yearling age group. Of course, it may be that the 3 to 4-month-old age group is the one most susceptible to the disease.

In terms of treatment, tests conducted at the Hamilton Laboratory indicated that Chloromycetin was most effective on the Pasteurella multocida organism, with penicillin a close second. Chloromycetin is rather expensive and locally available only on special order. Therefore, we decided to use penicillin, which appeared to work quite well.

It is our understanding that Dr. Jellison of the Hamilton Lab. is still not entirely convinced that the organism Pasteurella multocida is necessarily the causative agent in this illness, but may represent a bacterial infection which has responded to favorable conditions within the animal body brought on by an, as yet, unknown factor/s. It is conceivable that the causative factor may be external, i.e. weather, forage, and associated conditions, rather than one originating within the body of the animal. Until more is learned about this particular disease problem, diagnosis and methods of treatment remain somewhat conjectural.

With indications that the symptoms of this disease were evident in September of 1964, and again more pronounced in September of 1965, we can undoubtedly anticipate a similar problem in the fall of 1966. With intensified range reconnaissance, utilizing horses, and field treatment of all suspect animals with long-lasting penicillin, we can undoubtedly minimize our losses.

As a matter of interest, we have found that the problems of capturing buffalo calves and yearlings in the field for treatment, with horse and rope, can be overcome. The problems involve the extremely large windpipe of the buffalo, which will withstand very little rope pressure, and their tremendous strength. These two qualities combined with a pugnacious disposition make neck-roping a risky business. We have found that calves under three or four months of age can generally be neck-roped if handled with a "loose" rope. This is particularly true of calves weakened by illness or disease. Calves in this age group and older that cannot be neck-roped, may either be roped around the horns, if horn development is sufficient to provide a target, or may be roped by the

front or hind feet. One yearling was handled successfully by roping the horns and then "picking up" the hind feet. We have had occasions when one man on horseback could rope and hog-tie a small calf without assistance but, generally speaking, it is much wiser to have two men, well mounted and adept at roping, working together. Again, it must be emphasized that our experience indicates that these methods will work with animals up to the yearling age class that have been weakened by injury or disease. We doubt very much that a big, healthy yearling could be handled in this manner. The smallest calves have shown a willingness to charge a man or a horse without much provocation. An animal with both size and vigor could create problems on the opposite end of a short rope.

We experienced an outbreak of distemper in the refuge horses on June 22. The disease was first noticed in one horse and, within a few days, had spread to all 13 refuge horses plus two being considered for purchase. Considering the normal incubation period required before the symptoms of this infection become evident, Dr. Keyser felt that the horses were undoubtedly exposed to the infection on the saddle club ride on June 13. Those horses that had to be used and the two privately-owned horses were given a series of shots, the remainder were turned out until the infection ran its course. All animals recovered satisfactorily.

An emaciated $1\frac{1}{2}$ -year-old male white-tail was shot on December 9. The animal was obviously quite weak and showed indications of excessive scouring. Dr. William Longhurst, here on a collecting assignment, examined the deer superficially and felt that a heavy infestation of intestinal worms had probably caused debilitated condition. Necropsy was not performed.

III. REFUGE DEVELOPMENT AND MAINTENANCE

A. Physical Development

1. Flood Repair

Flood damage repair and cleanup work was continued under a special appropriation made in 1964 following the serious Mission Creek flood on June 7 and 8 of that year. Work under this program extended through June and part of July in the current report year.

Approximately 880 lineal feet of creek bank was re-sloped and rip-rapped on lower Mission Creek. Rip-rap material was contracted for delivery to the job site at \$4.00 per cubic yard.

Flood debris was cleared from Mission Creek and adjacent bottom lands from headquarters east to the east refuge boundary, a distance of about four miles.

A damaged bridge in Dublin Gulch on the north boundary road was replaced with a 72"x44"x36' corrugated aluminum pipe arch, and the subsequent earth fill rip-rapped. The north road was washed

out in two additional places, which required earth fills to bring the road back to grade and stabilize the shoulders.

The old concrete inlet and outlet structures at the display pond had to be replaced with galvanized metal pipes, 29"x18"x21", with flashboard riser-type headgates. Interlocking steel piling was later required around the outlet to prevent the pipe from being washed out. An average of three feet of deposited silt was removed from the display pond and used to fill small, swampy areas adjacent to the picnic area, entrance road and Quarters #2. The silt material was also used to construct one small nesting island in the center of the pool for our resident flock of Canada geese. Those areas filled were later leveled and seeded to ladino clover and a mixture of native grasses.

2. Fence Repair

Approximately one-quarter mile of big game fence was rebuilt in the Elk Lane prior to roundup. The old wooden gates at Six-Gates were replaced with aluminum gates. About $1\frac{1}{2}$ miles of boundary fence were reconstructed on idle refuge lands lying east of U.S. Highway 93, to prevent trespass grazing by domestic livestock from adjoining lands.

The five + miles of Sheep Pasture fence were gone over completely prior to roundup, and sections weakened by rotten posts were strengthened by addition of steel posts.

The corrals at the slaughterhouse required extensive repairs prior to roundup in October. Many of the corral posts were found to be rotted off beneath the ground, and large sections in two corrals required complete replacement. Decayed boards on catwalks, etc. were also replaced. New catwalks were added to eliminate the need for men to work in the corrals with the animals. Protective barriers, wood railings and woven wire, were installed on the inside of the catwalk used by the public during roundup. Small pipe and wire gates were also added to restrict the public from the work areas. This worked extremely well and reduced the hazards to both refuge personnel and the visiting public.

3. Roads and Bridges

All refuge roads were bladed once during the year. The large amount of oversized rock, turned up in the process of blading the gravelled 17 mile tour road, was effectively eliminated with a rock rake borrowed from the Lake County road department.

The 1.3 mile loop road around the headquarters exhibition pastures received a covering of rock chips and an oil penetration coat in July. This work was performed for us by the Montana State Highway Department for \$1,111.52, and has eliminated the serious dust problem which existed previously. The appearance of the exhibition area has also been improved considerably. A 42"x36'

galvanized corrugated metal pipe was installed to replace the old west bridge across the canal on this road in March.

The rotted log stringers and wood decking on the upper Mission Creek bridge were completely replaced in September. Eleven new 15"x40' larch pole stringers were obtained at no cost from the Flathead Agency. The old flood gate was reinstalled.

4. Building Maintenance

Quarters #2 - The rear porch was leveled, the floor and several floor-joists replaced, and new screen installed. The porch was repainted inside and out. Several rotted boards on the front porch were replaced and the floor given two coats of paint. The stucco exterior was given a coat of white waterproof Bondex cement paint, and all outside wood trim painted.

Quarters #3 - A much needed remodeling of the bathroom was accomplished in this residence. A new lavatory, vinyl covering on the floor and walls, to a height of four feet, with waterproof Mar-Lite wallboard were installed. The wood shingle roof on this house was repaired and stained with a dark green shake and shingle finish

Building #4 - The porch on the office apartment was re-floored, new screen installed, and painted inside and out. A concrete step was poured to replace the existing rotted wood steps. The roof, stucco exterior and wood trim on the office was completely painted.

Building #6 - The old cow barn roof was jacked up and leveled, new 3/8" plywood sheathing installed and covered with 235# Tri-Tab asphalt shingles. This work was done by contract.

Building #12 - The headquarters pump house was given a complete paint job on roof and exterior stucco walls.

Building #15 - The east garage received two coats of green metal paint on the roof and the exterior walls and trim were painted.

Building #16 - The west garage was painted in the same manner as #15, above.

Building #17 - This metal building, the truck garage, received one coat of paint on roof, and exterior walls and trim.

Building #19 - The service building and shop received one coat of green shake and shingle finish on the roof, and the windows and doors were trimmed with green paint.

Building #20 - Metal roof and exterior trim painted.

Building #26 - The old outdoor pit-type toilet at the slaughterhouse was retired this year with the addition of a 6'x10' bathroom on the east side of the slaughterhouse living quarters. The bathroom contains a lavatory, stool and shower. A septic tank was installed

about 100-feet east of the building. The new bathroom improves sanitation conditions and puts us one step closer to complete compliance with Health and Sanitation requirements established by the State of Montana for the operation of a slaughterhouse.

A concrete foundation wall 10" thick and 16" high was built along the north side of the cooling and shipping rooms in the slaughterhouse. This will eliminate rotting of the sills that has occurred in the past from washing the interior of the building, and will permit us to keep the floors of these two rooms much cleaner.

Quarters #63 - Installation of new equipment included; aluminum storm doors on the front and rear entrances, a lavatory in the bathroom, and a set of plastic laundry trays in the basement.

Quarters #64 - The hardwood floors in this residence were completely refinished during the period in which it was vacant. Installation of new equipment included; an aluminum storm door on the front entrance, a set of plastic laundry trays and a fast-recovery hot water heater in the basement. A new 125 amp electrical panel was installed to replace the old panel, which no longer conformed to current electrical codes. New wiring was provided for the washing and drying appliances in the basement, and existing circuits were split up.

5. Automotive Equipment Maintenance

Major repair and maintenance work accomplished included; a new engine installed in the 1951 GMC dump truck, I-50887; transfer case overhauled on the 1952 Dodge power wagon, I-75617; control steering system rebuilt on the #12 "Cat" motor grader; brake lining replaced on the TD-9 dozer; preventative maintenance and 5,000 mile checks performed on all equipment as required.

6. Miscellaneous

A new 1,100 bushel round metal granary was purchased and installed at the east end of the service area. The structure was assembled on a concrete foundation and floor extending 10" above ground level.

The sprinkler irrigation system in the exhibition pastures was improved by installation of a metal pipe turn-out and concrete collecting box. The pump and electric panel were enclosed within a 6'x6' pump house.

A new sprinkler irrigation system was installed in the headquarters picnic area in August. Irrigation of the picnic grounds will improve its appearance, extend the period of use, and eliminate any danger from fire.

Two new, two-way 8'x8' refuge identification signs, constructed by the Regional sign shop, were installed at the headquarters entrance and at the southeast corner of the refuge, adjacent to U.S. Highway 93. Native juniper was used to frame the signs.

A sizeable number of juniper and fir posts salvaged during the APW program in 1963 and 1964, and excess to our needs, were made available to other refuges in our area. A total of approximately 1,500 posts was transferred to the Charles M. Russell Range, medicine Lake, Ravalli and Kootenai Refuges, with over 1,000 going to CMR. Posts for the last three refuges were hauled in conjunction with grain transfers to the Bison Range.

B. Plantings

1. Trees and Shrubs. Two apple trees were planted at Quarters #3, and five shrubs, including three Savin evergreens and two Potentilla, were planted in front of Quarters #62.

2. Upland Herbaceous Plants. The 115 acres of range reseeded in 1964 generally did very well. The 97.5 acres of seeding on disturbed areas following APW timber stand improvement work, did particularly well.

Much of the buffalo grass (Buchloe dactyloides) seed planted in buffalo wallows last year germinated and became established on most plots. They were short-lived, however. Buffalo use of these wallows had eliminated virtually all seedlings by the end of July. We doubt very much that this type of seeding will ever succeed, nor do we consider it particularly important. We feel that erosion problems attributed to buffalo wallows have been grossly overrated on the Bison Range.

The Bison Range is considered as one of the finest native perennial bunchgrass ranges in Western Montana. We believe that as a general policy, all reseeding should be limited to those species indigenous to the Range or to the surrounding area. Although buffalo grass is historically associated with the bison, it is not native to this region and is out of place on the Bison Range. Exotic species such as crested wheatgrass are certainly an improvement over cheatgrass, but are extremely poor substitutes for native bunchgrasses. There is no reason to believe that much of our fair to good range sites will not respond to improved grazing practices. This approach is far less expensive and far more desirable than reseeding. On those areas which contain relatively pure stands of red three-awn and cheatgrass, the method of reseeding known as range-interseeding, with native grasses, may be desirable. We hope to establish a few small experimental range-interseeding plots in the near future in cooperation with Range Extension Specialist, Don Ryerson, Montana State University, Bozeman.

Approximately three acres of dykes and fill areas adjacent to the display pond were seeded to ladino clover and a mixture of native grasses this year.

C. Collections and Receipts

None.

D. Control of Vegetation

1. Biological Control. The use of chemicals for the control of St. Johnswort or goatweed, Hypericum perforatum L., was discontinued in 1959 upon establishment of a substantial population of Chrysolina sp. beetles. This beetle feeds specifically on the goatweed plant and was first introduced to the Bison Range in 1948. Control by beetles exclusively since 1959 has been highly sporadic. We have had virtually no control for the past five years, including the current report year. During this five-year-period, goatweed has steadily extended its range throughout the refuge and now infests an estimated 6,000 to 8,000 acres.

During the late spring and early summer months this year, small numbers of beetles were generally found throughout the refuge wherever goatweed occurred. Reproduction apparently was quite poor, however, for nowhere did beetles occur in sufficient numbers to exercise any measure of control.

The decision as to whether chemicals should be used for noxious weed control on a National Wildlife Refuge is always a difficult one. This was particularly true in our case, where an alternate course of action was available - that is to rely on the beetles and learn to live with goatweed. Although perhaps the easiest and certainly the least expensive, the later approach didn't appear to be a very realistic one, in the light of current knowledge.

Professor Mel Morris, in addition to being a range specialist, is also perhaps the best informed individual on Chrysolina beetle introductions to the State of Montana. He indicated that he had believed goatweed would not invade range sites in good condition, and had felt that the maintenance of a range in proper condition was the most effective control measure. He also advised that the Bison Range beetle introduction was considered to have been the most successful in the State. In light of our present situation and his experience elsewhere, he felt that beetles in Montana are probably on the very edge of their range of adaptability, and doubted that they will ever prove successful. He also agreed that his earlier feelings regarding range condition were no longer entirely valid. Goatweed has invaded many of our best range sites, and is gradually replacing perennial bunchgrass plants that formerly existed in nearly pure stands.

With this basic understanding of the problem, it was decided that goatweed could no longer be ignored, and that a chemical control program should again be adopted. This was done with the understanding that chemical control would not replace beetles and natural or biological control, but would, rather, supplement it in an attempt

to confine goatweed infestations during this extended low in the beetle population. It appears at this time that a combination of these two control methods will continue to be necessary to effectively control this troublesome weed. Chemical control may not be necessary or may be curtailed in any one year, depending upon beetle production. The results of our chemical control work on goatweed is discussed below.

2. Chemical Control. With the unexpected availability of additional funds within the last two weeks of the fiscal year, we expanded our chemical control program to include 500 acres of goatweed-infested lands, and an increased amount of Canada thistle spraying. (It was estimated that Canada thistle had infested 2,000 to 3,000 acres.) It was felt that the goatweed acreage could be most effectively and economically sprayed by helicopter at the proffered rate of \$1.25 per acre. For this reason we also decided to do some experimental aerial Canada thistle spraying in selected areas.

The effects of the Canada thistle spraying, by both ground and aerial equipment, generally appeared quite good. The goatweed spraying, however, met with only limited success. When the spray solution was applied at the proper speed and height, excellent kill (apparent) was achieved. The 2# application rate appears to be quite effective when properly applied. Observations in the spring of 1966 will permit a more accurate evaluation of this work.

E. Planned Burning

None

F. Fires

There were no fires on the Bison Range during 1965. Refuge personnel extinguished a small fire on the Northern Pacific railroad right-of-way just opposite the Moiese store on July 28. A report of this fire was submitted to railroad officials at their request.

IV. RESOURCE MANAGEMENT

A. Surplus Buffalo Disposal Program

1. Live Sales

We sold a total of 34 long-yearlings this year, and somewhat to our surprise, again had more applicants than animals. We had expected that the \$35.00 increase in price, to \$235.00 per animal, might discourage many of our potential applicants. It apparently had very little affect. Following is a summary of the sales:

<u>Consignee</u>	<u>Number</u>	<u>Sex</u>
George Skakel, Jr.	1	Bull
Rancho Idaho, Inc.	2	Heifers
Bruneau, Idaho		
W. E. Arrington		
P. O. Box 581		
Idaho Falls, Idaho	3	Heifers
Earl Lindstrom		
Route 5		
Idaho Falls, Idaho	2	Heifers
Leonard W. Murray		
Rt. 2, Box 291M	1	Bull
Linden, California	1	Heifer
Darrell Maulding		
Star Route, Box 66		
Silverton, Oregon	3	Heifers
Kenneth Adkins		
Route 2		
Newcastle, Wyoming	3	Heifers
Dale Lukes		
R. R. 1		
Glenville, Minnesota	3	Heifers
Stanley Girtler		
Box 245		
Winona, Minnesota	3	Heifers
Glen Lohman	1	Bull
Sentinel Butte, North Dakota	2	Heifers
Meissner Ranches, Inc.		
Chester, Montana	3	Heifers
Don Murphy		
Box 188		
Eatonville, Washington	3	Heifers
Robert L. Pugsley Jr.		
Chester, Montana	2	Bulls
Frank Howard Jr.		
138 East Main		
Grangeville, Idaho	1	Heifer

2. Transfer and Donation of Live Animals

As mentioned earlier in this report, three two-year-old animals, two cows and one bull, were transferred to the Charles M. Russell Range for display in the cooperative CMR-Corps of Engineers exhibition pasture at Fort Peck.

3. Meat Sales

The age and sex composition of the 94 buffalo butchered was as follows:

<u>Age</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
10 plus		2	2
4 to 9 years	12	23	35
3 years	15	5	20
2 years	23	13	36
1 year	—	<u>1</u>	<u>1</u>
Totals	50	44	94

Meat applications were handled in the same manner as in 1964. Four animals were reserved for distribution by the Regional and Central Offices, and three reserved for the Flathead Indian Agency. Club requests were filled next in priority, then a drawing of individual and commercial applications was held and the remaining meat allotted accordingly. The following figures show the breakdown of applications received and orders filled for 1964 and 1965. The three orders not filled in the club category resulted from cancellations.

<u>Category</u>	<u>Applications Received</u>		<u>Orders Filled</u>		<u>Total Animals Sold</u>	
	<u>1964</u>	<u>1965</u>	<u>1964</u>	<u>1965</u>	<u>1964</u>	<u>1965</u>
Regional Office					.5	1.5
Donation to schools w/Indian children in attendance					3.0	3.0
Clubs	32	48	30	45	13.75	20.5
Commercial	31	22	14	13	6.75	6.5
Individual	462	564	208	250	<u>52.0</u>	<u>62.5</u>
Total Animals Sold					76.0	94.0

The drawing for commercial and individual applications was held on October 1, and was conducted by Albert Rennie, Administrative Manager, Flathead Agency, Dixon; Bernie Yenock, Forester Work Leader, Kickinghorse Job Corps Camp, Ronan; and Rev. Robert Larsson, St. Ignatius.

After notices were sent out to successful applicants in the drawing, a total of 77 cancellations occurred, as compared to 64 in 1964. This required another series of notices and, of course,

delayed sales. Fortunately, all sales had been made before butchering was completed.

We experienced a few cases of meat spoilage this year as a result of delayed railway shipments. One-half carcass shipped to a Sportsmen's Club in Leavenworth, Washington, for example, was six days enroute. Over 80 pounds of the meat had to be discarded. We don't know what the solution to this problem is, but registering a complaint with the railway company may help.

4. Sale of Buffalo Hides

In January 1965, there were still eleven hides left from the 1964 disposal which remained to be sold. Nine of these were sold for established prices and brought \$127.00. The remaining two were included in the February hide auction, and sold for \$35.00. Adding these amounts to the \$1,170.00 received for 65 hides sold prior to December 31, 1964, gives us a total of \$1,332.00 for the 76 hides from the 1964 disposal, or an average of \$17.53 per hide. Although somewhat lower than the \$18.32 averaged in 1963, this is still quite good.

The demand for hides, and hides with skulls skinned for mounts, from the 1965 disposal program was excellent (despite an increase in price for large bull head and life-sized mounts of \$15.00 each). By the end of the year, only three cull hides and one good three-year bull skinned for a head mount remained to be sold. The 88 buffalo hides sold netted \$1,572.50, or an average of \$19.23 per hide, which is excellent.

5. Sale of Skulls

Despite the fact that prices for skulls were doubled in 1964, the demand for skulls during the forepart of 1965 exceeded the supply. To further discourage the casually interested person from purchasing them, prices for skulls were again increased this year from \$5.00 for 2 and 3-year bulls, and \$10.00 for large bulls, to \$5.00 for a small bull skull, \$10.00 for medium bulls, and \$20.00 for large bulls. The skulls continued to sell like the proverbial hot-cakes. A total of 56 skulls was sold for \$288.00.

In the case of hides which have been skinned for mounts, the skulls are included in the cost of the hides and therefore are included in the income shown for hides alone.

6. Sale of Hooves

A total of 22 buffalo hooves at twenty-five cents each was sold for \$5.50.

7. Donations of Hides and Skulls

A 5-year-old bull hide and skull, skinned for head mount, were donated to the Utah State Park and Recreation Commission, at the request of Refuge Manager Julian Howard, Wichita Mountains

National Wildlife Refuge.

Three large buffalo bull skulls were donated during the year, with one each going to: the Shoshone Tribe, Fort Washaki, Wyoming, for their Sun Dance ceremonies (the tribe lost their ceremonial skulls in a recent fire); the Zoology Department, University of Idaho, Moscow, Idaho, for educational and display purposes; the Department of Biological Sciences, North Idaho Junior College, Coeur d'Alene, Idaho, for educational and display purposes.

B. Surplus Elk and Deer Disposal

1. Meat Disposal

The twenty elk and 133 of the 137 deer taken during the fall disposal were shipped to various schools in Montana for use in the State's hot lunch program. The handling charge of \$25.00 per elk carcass and \$5.00 per deer carcass remained the same. Arrangements for this program were made through the State Department of Public Instruction as in the past. The State was billed for 132 deer and 19 elk for a total of \$1,115.00. No charge was made for one fawn accidentally shot, although it was included in the shipments.

One elk was sold to the County Extension Office in Ronan, Montana, for use in the Lake County 4-H Council Junior Fair, held annually in August. Authorization for this sale was made several years ago, and the County Agent requests one elk each year. The regular handling charge of \$25.00 was made for this elk carcass.

Costs for collection of the deer and elk were computed following completion of the disposal program in an effort to determine (1) how realistic the present handling charges are, and (2) how we might reduce future disposal costs. Following is a summary of our computations:

	<u>Deer</u>		<u>Elk</u>	
		<u>% of Total</u>		<u>% of Total</u>
Labor	\$1,495.48	81	\$578.40	90
Materials	291.00	16	40.74	6
Equipment	60.00	3	20.00	4
Total:	\$1,846.48	100	\$639.14	100
Cost/Animal	13.88		31.96	
Revenue anticipated	7.44*		28.25*	
Difference:	-6.44		-2.71	
Man Hrs. Required	522		200	
Hrs./Animal	3.8		10	
Total Pounds Meat	12,001		5,538	
Avg. Weight/Animal	90.2		277	
Cost/lb. to Collect	.154		.115	
Cost/lb. to collect-				
less hide revenue	.127		.103	
Cost/lb. to Schools	.056		.09	
Difference:	-.071		-.013	

*Includes handling charge plus average receipts from sales of hides, i.e. \$2.44 for deer and \$3.25 for elk.

Refuge costs for the collection of deer and elk during the annual disposal programs are not available for the years 1958 through 1964. However, for comparative purposes, average cost-revenue data for the period 1954 (the year the present handling charges were established) through 1957 are of interest:

	Deer		Elk	
	<u>1954-1957</u>	<u>1965</u>	<u>1954-1957</u>	<u>1965</u>
Cost/Animal	5.59	13.88	14.09	31.96
Revenue/Animal	6.20	7.44	25.70	28.25
Difference	+ .61	-6.44	+11.61	-2.71

The increased cost of collecting in 1965 reflects both increased labor costs and a difference in deer availability. For example, the Maintenceman salary level (comparable to the present Maintenceman II) has increased from \$1.27 to \$2.85 per hour, or about 80 percent. Deer availability is reflected in man-hours required per animal collected. The 1952 disposal required approximately three man-hours per deer, with an estimated winter population (post-disposal) of 530 deer. The 1965 disposal required 3.8 man-hours per deer, with an estimated winter population of 375 deer.

The handling charge was originally intended to cover all refuge costs for collection. It's obvious that this was not the case in 1965, and probably hasn't been for several years. Although the simplest solution would appear to be an appropriate increase in the handling charge, this isn't necessarily desirable nor, perhaps, possible. The schools are not compelled to take the meat, and we have had some indication that they would be reluctant to accept it if present handling charges were increased. It's possible that an increase might be psychologically more acceptable if the handling charge was placed on a per pound basis. For example, the schools might be more receptive to an 11¢ per pound handling charge than a charge of \$10.00 per deer carcass, even though revenue accruing to the refuge would be approximately the same in both cases (based on a 90.2 pound average weight).

Considering that labor costs represent between 80 and 90 percent of our cost for collection, we believe an effort to reduce this cost would be most logical and certainly more desirable than increasing the handling charge. Inclusion of fawns in the age groups collected would automatically reduce the amount of time required for disposal and thereby decrease labor costs. During the first year that deer were removed by shooting (1952), all age groups were taken. Fawns were subsequently excluded from disposal quotas when the schools indicated a reluctance to pay \$5.00 per carcass for an animal that averaged between 30 and 50 pounds dressed.

The only biological justification for the continuance of a no-fawn removal policy, is that by not shooting fawns, the proportion of fawns in the winter herd is increased, thereby reducing the proportion of reproductive does in the herd. This reduces the actual percentage increase in the herd resulting from births.

We suspect that the advantages of shooting fawns would far outweigh the benefits derived by not shooting them. The State's reluctance to pay a handling charge for fawns could probably be overcome by placing the charge on a per pound basis. We believe this may be the most equitable method of assessing a handling fee for both the State and the refuge. This approach will be seriously considered for adoption during 1966.

2. Sale of Elk and Deer Hides

The 78 deer hides and 16 elk hides from the 1964 disposal were sold in February, 1965 through our annual auction bid sale. The deer hides brought \$187.88 and the elk hides \$52.47.

A total of 112 deer hides and four elk hides has been sold from our 1965 disposal, netting \$266.82 and \$16.00 respectively. Thirty-six white-tailed deer tails were sold for \$12.60, with 15 going to a Boy Scout troupe and 21 sold for use as fly-tying material. Four deer feet were sold for 25¢ each, or a total of \$1.00.

3. Sale of Antlers

The demand for elk and deer antlers was quite surprising this year. A total of \$78.75 worth of antlers was sold.

C. Sale of Antelope Hides

Five antelope hides from scientific collections made in 1964 were sold in February for \$10.00.

D. Proceeds of Sales

Listed below are the receipts from sales for the period January 1 through December 31, 1965:

Live buffalo	\$7,990.00
Butchered buffalo	23,630.00
Hearts, livers and tongues	13.00
Deer and elk meat	1,140.00
Buffalo hides	1,734.50
Deer hides	454.70
Elk hides	76.47
Antelope hides	10.00
White-tailed deer tails	12.60
Buffalo and deer feet	6.50
Skulls and antlers	372.75
Employees horse-grazing fees	24.00
Employees wood purchases	61.00
Marsh concession	558.71
Sale of surplus lookout towers	416.16
Sale of surplus Bldg. #2-Pablo	15.00
Sale of surplus vehicles	1,000.00
Sale of used wire and posts	281.63
Sale of surplus used property	96.30
Total	\$37,893.32

V. FIELD INVESTIGATION OR APPLIED RESEARCH

A. Antelope Reproductive Physiology Study

A research project proposed by graduate student, B. W. O'Gara, University of Montana, involving antelope collections on the Bison Range, was approved on June 4. The study is being done to partially fulfill the requirements for a Doctor of Philosophy degree (Zoology), and is entitled, "A Study of the Reproductive Cycle of the Female Pronghorn Antelope (Antilocapra americana)". As mentioned earlier, twelve adult female antelope were collected by refuge personnel for Mr. O'Gara during the year. An additional twelve animals have been approved for collection during the course of this study, which we understand will be completed by December, 1966.

B. Antelope Behavior Study

A study entitled, "The Behavioral Development of the Pronghorn Antelope Kid, (Antilocapra americana)", proposed by graduate student Peter Bromley, in partial fulfillment of a Master of Science degree in Zoology, University of Montana, was approved on July 29.

Mr. Bromley's proposed two-year study hinged on an adequate sample of kids being marked in May for later identification. The preparation of the study outline wasn't completed until mid-July and, of course, wasn't approved until July 29. Bromley did manage to ear-tag five kids, and a certain amount of field work was accomplished. It soon became apparent, however, that the study had been rather poorly planned and was being poorly supervised. We got the very distinct impression that the basic objective normally associated with graduate studies of this nature - that is to develop the individual's ability to conduct research in accordance with the precepts of scientific investigation - was in this case subordinate to the production of a thesis. We hope we're wrong.

C. Buffalo Weight Loss Study

This study was inactive this year.

D. Buffalo Age, Weight and Longevity Study

We presently have twenty-seven buffalo specially branded for individual identification. It was originally planned to mark an additional four animals, two bull and two heifer calves, each year, and all animals marked were to be allowed to live out their lives. With the present size of our herd, it's obvious that this plan will have to be tailored down somewhat. We feel that a total sample of no more than twenty or twenty-five animals will have to be maximum. This study is to be re-evaluated and a practical plan adopted prior to roundup in 1966.

E. Experimental Balsamroot Spraying

A final report of this study, prepared by Assistant Refuge Manager Jack Richardson in June, 1965, has been submitted to the

Regional Office. Jack took time out from his assignment with the Malheur Job Corps Camp to complete the field evaluation work and prepare the report. For the benefit of those readers who may not have had the opportunity to review the report, we shall include Mr. Richardson's summarization:

"The Experimental arrowleaf balsamroot spraying project conducted on the National Bison Range during 1963 and 1964 has shown that balsamroot can be controlled by the application of two pounds acid equivalent of 2,4-D amine per acre. The degree of control is dependent on the developmental stage of the balsamroot at the time of spraying. Actual kill of up to 83.5 percent can be realized when the balsamroot is sprayed just as the majority of the plants reach full bloom. Lesser degrees of kill are realized when spraying is done at an earlier stage of development.

"Other forbs, with the exception of goatweed, appear to be little affected by spraying with 2,4-D. Goatweed is controlled completely by the latter application and approximately 70 percent kills are obtained from earlier application.

"Shrubs show no long-term effects from spraying. Aerial parts of the plants may be killed when sprayed, but resprouting takes place a year after spraying.

"Grass responses to the control of balsamroot is varied by the treatment following spraying. When spraying is not followed by spring grazing deferments, grass response is limited to a great increase in cheatgrass and little or no change in desirable bunchgrasses. When spraying is followed by spring grazing deferments, the desirable bunchgrasses show increased vigor and enlargement of basal areas. Seed production is good and seedling production is outstanding. Forage production can be increased by 35 percent during the year of spraying.

"The cost of spraying balsamroot with an airplane varies from \$2.20 to \$2.30 per acre. On rougher areas helicopter spraying can be done for approximately \$0.25 more per acre."

F. Experiment in Tranquillizing and Anesthetizing Drugs

This project was approved on August 10, 1964, and the Paxarms syringe weapon equipment, purchased in New Zealand, finally arrived in July of this year. This study was conceived and the study outline prepared by Jack Richardson. Consequently, no field work was accomplished. Our new assistant didn't arrive until December, and the new manager has had no previous experience with this capturing technique. Time devoted to this project was spent developing a familiarity and understanding of the methods involved. We hope to initiate field work early in 1966.

G. Refuge Plant Collection

Several species of plants were collected, identified and pressed for the refuge herbarium, but none was mounted.

H. Waterfowl Banding

The limited amount of waterfowl banding done on the Bison Range this year is discussed in Section II.

I. Hemlock Loopers

The false hemlock looper (*Nepytia*)* infestation on Looper Ridge, which caused the U. S. Forest Service so much concern in 1964, was apparently drastically reduced this year. A small amount of damage was noted during the early summer months in the tops of Douglas fir trees above Looper Pond, but no significant evidence of damage was observed. As indicated in the 1964 Narrative Report, the loss of a few Douglas fir trees would be considered desirable. We believe this "problem" has resolved itself.

(*This insect was first tentatively identified as *Nepytia canosaria*, but subsequent work showed that it could be *N. freemani*.)

J. Range Site and Condition Survey

A report of the range survey conducted for us in 1964 by the Soil Conservation Service was received from Range Conservationist, Robert L. Ross, in February of this year. Copies of this report have been reviewed and approved by the Regional and, we presume, Central Offices.

Mr. Ross's recommendations involve, basically, the adoption of a rest-rotation system of grazing for our buffalo herd. Under the proposed system, the herd would be split into two groups, and the pastures paired off according to comparable initial stocking rates - four pastures per herd in a 4-year rotation. Each herd will be rotated every three months within the four pasture unit. The system has a number of advantages, namely; (1) each pasture would be grazed during the critical season, May and June, only once every four years; (2) each pasture would get two consecutive complete deferments until fall and one partial deferment in the four-year cycle; (3) with a concentration of animals on a pasture, there should be more uniform grazing use as a result of better distribution; (4) it will facilitate roundup and should reduce labor costs, as the animals could be driven directly into the corrals from six of the eight proposed pastures; (5) deferred rotation grazing system will work in exceptionally well with our weed control programs.

Two additional division fences, comprising about four miles of fence, will be required to subdivide the Alexander Basin and the Upper West and Southwest Ranges. All material for the two fences has been purchased and construction will begin in March of 1966. The new system will also require that all division fence gates remain closed throughout the year, necessitating installation of cattle guards on the public tour road. The cattle guards have been purchased and we hope to have them installed by next summer.

VI. PUBLIC RELATIONS

A. Recreational Uses

Public use throughout the year was commensurate with the mild weather conditions that prevailed. The heaviest period of use extended from April through September, with fall visitation remaining unusually high and extending through mid-November.

An estimated 300 to 400 people, plus several school groups, came to observe the activities in the corrals during roundup. As indicated earlier, most of the problems experienced in past years with visitors during roundup were effectively eliminated by the addition of several improvements to the catwalks. Although the visitor catwalk remained extremely crowded throughout both days of corral work, no significant problems developed. Refuge Manager Kenney, Ninepipe Refuge, was on hand to work with the various school groups and photographers, to insure that all were properly attended to and that no one wandered into the path of buffalo.

The daily conducted tours began on June 17 and ended on Labor Day, September 6. The number of participants again increased slightly, a reflection of the gradual increase in public use experienced each year. A summary for the past six years follows:

	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>
Number of Tours	57	62	68	82	82	78
Number of Cars	248	232	397	539	554	650
Number of People	1,115	1,030	1,792	2,451	2,501	2,775

The National Bison Range was designated in 1965 as a user fee area under the Land and Water Conservation Fund Act of September 3, 1964. Fees were required only for participation on the guided tours. Tour participants were required to have either the \$7.00 Recreation/Conservation Sticker for their car or purchase a 25¢ individual tour ticket for all persons 16 years of age and older. Other than a few minor problems with the mechanics of collecting fees and distributing tickets, the collection of tour fees created no significant problems, and was generally quite well received by the public. Thirty-six Recreation/Conservation stickers and 1,267 25¢ daily fees were sold for a total of \$568.75. Our cost of collection was estimated at \$215.00. Although we have no serious objection to this program, it hardly seems worth the time and effort, not to mention the nuisance value to the public, to continue it when net profits amount to only \$353.75. We can expect a gradual increase in public use on this area as time goes on, but we doubt that the profits from the sale of Stickers and tickets will be particularly significant for several years.

B. Refuge Visitors

Feb. 8 Mr. Guy Baier, Bureau of Land Management (Montana Power
Company right-of-way)
Mar. 8 Mr. Clem Rose, Soil Conservation Service (Cooperation)

Mar. 8 Rev. Robert Larsson, St. Ignatius (Commercial photography-frequent visits)
 Mar. 9 Mr. Robert Ross, Soil Conservation Service, Butte, (Range Site and Condition Survey)
 Mar. 16 Mr. Mike Kari, Columbia Refuge (courtesy call)
 Mr. Derk Turner, R.O. Engineer (Job Corps site survey)
 Mar. 26 Mr. Lee R. Jacoby, R.O. Engineer (Job Corps site survey)
 Apr. 4 Mr. & Mrs. Sheldon Dart, National Elk Refuge (courtesy call)
 Apr. 6 Mr. Edw. Flickinger, US F.W.S., Research Branch, Denver (range tour)
 Apr. 10 Mr. Vernon Ekedahl, Regional Refuge Supervisor, and Messrs. Howard Fast and Derk Turner, Engineers, Portland; Mr. John E. Schwartz, U.S.F.S., Portland; Messrs. Vivion-Medicine Lake; Dart-National Elk; Brooks-Turnbull; Devan-Ravalli; Stroops-Benton Lake; Bob Fields, Marvin Kaschke and Bob Burkholder-Charles M. Russell; Hoffman-Bowdoin; Lewis-Ruby Lake (C.J. Henry's retirement party)
 Apr. 21 Dr. Phillip Wright, Zoology Dept., University of Montana, with graduate students Bart O'Gara and Mike Kinsella, and exchange student Raphael Jingu, Tanzania, Africa (collect antelope)
 Apr. 25 Messrs. James McLucas and Roger Fliger, Montana Fish & Game, Jack Hume, Ass't. Director for World's Fair Centennial Train, and Ray Rathie, trucker, Helena, Montana (pick up Tommy II and 2 cow elk to go to World's Fair in New York)
 Apr. 25 Mrs. Joyce Lott, Ronan Pioneer (news story-frequent visits)
 May 4 Messrs. Forest Brooks and James Vaughn, Fort Niobrara Refuge (to get 2 bull elk)
 May 9 Mr. & Mrs. Mel Ruder, Editor Hungry Horse News, (photography)
 May 19 Mr. Bud Black, State Highway Dept. (discuss oil coat for exhibition pasture road)
 May 20 Mr. John Van den Akker, Refuges, Portland (inspection) and Joseph Mazzoni, CMR (orientation and inspection)
 May 24 Mr. Philip Dumont, Branch of Refuges, Washington, D.C. (Inspect recreation facilities and public use)
 May 24 Mr. Avery Wyant, Lake County Sanitarian, Polson (courtesy call)
 June 7 Miss Cynthia Chapman and Mr. Joe Tiffenback, Educational Horizons, Los Angeles, California (photography)
 June 7 Mr. and Mrs. Roger Vorderstrasse, free-lance photographer and former Service employee (photography)
 June 13 Annual Saddle Club Ride (210 participants) sponsored by Mission Range Riders, St. Ignatius, Montana
 June 14 Dr. Robert Hoffman, U of M (Bromley's antelope study)
 June 14 Mr. Leland Schoonover, Polson (courtesy call and invitation to Montana Wildlife Federation Meeting)
 June 15 Mr. Bud Black and crew, State Highway Dept., Ravalli (oil exhibition pasture road)
 June 22 Mr. Faye Couey, State Fish and Game Dept., Kalispell (courtesy call)
 June 25 Mr. Bill Sweeney & family, Branch of River Basins, Billings (courtesy call and tour)
 June 30 Mr. Ned Judge, KNNE Statewide Educational TV, Albuquerque, (photograph buffalo for TV film)

July 2 Mr. & Mrs. Count Lippens, President of "Reserves Nature
 Ves de Belgique", Knokke, Belgium (tour)
 July 2 Mr. & Mrs. Larry Linnard, Lecturer and Photographer,
 Maumee, Ohio (photography)
 July 7 Dr. Phillip Wright and Mr. Bart O'Gara, Univ. of Montana,
 (O'Gara's antelope study)
 July 8 Mr. Thomas F. Davies, Palo Alto, Calif., Photographic
 Society of America and Photochrome Club of San Francisco
 (photography)
 July 12 Mr. Howard Sheldon, Forest Biologist, USFS, Park Falls,
 Wisconsin (courtesy call)
 July 12 Mr. Dale Lott, Univ. of California at Davis, (proposed
 buffalo behavior study)
 July 16 Mr. John K. Smith, President, Sierra Anthropological
 Productions, Big Creek, California (photography)
 July 19 Mrs. Josephine Brooker, Ass't. Advertising Director, Mont.
 State Highway Commission, Mr. Lynn Vogl, Editor, Minnesota
 Motorist, Mpls., Minnesota, and Mr. Alan LeWin, St. Paul
 Pioneer Press, St. Paul, Minnesota (tour & photography)
 July 22 Mr. Roy F. Renoud, Chief Personnel Officer, CAS, Portland
 (courtesy call)
 July 22 Mr. Cos LaBarre, Labor Relations Officer, CAS, Portland
 (courtesy call)
 July 22 Mr. Skip Lynch, Soil Conservation Service, Hot Springs
 (cooperation)
 July 26 Mr. Fred Peché, Shoshone Tribe, Fort Washakie, Wyoming
 (skull for ceremonial purposes)
 July 26 Mr. Bernie Yednock, Forester, Kicking Horse Job Corps Camp
 (work project plans)
 July 29 Mr. and Mrs. C. J. Henry, Charlo, Montana (photography)
 Aug. 2 Mr. Harry E. Stiles, Ass't. Regional Refuge Supervisor,
 Mpls., Minn. (courtesy call and tour)
 Aug. 4 Mr. Adolph Zajanc, BSF&W Biologist, Univ. of California-
 Davis (courtesy)
 Aug. 4 Mr. John P. Blattner, St. Louis, Mo. (filming travelog
 "Montana-Gun of the West")
 Aug. 5 Dr. John Corcoran, Dept. of Agriculture Veterinarian,
 St. Ignatius (cooperation)
 Aug. 5 Mr. Gerry Atwell, Ass't. U of M Wildlife Research Unit
 (cooperation)
 Aug. 11 Dr. Phillip Wright, U of M, Missoula (antelope collection)
 Aug. 12 Mr. John Barnes, BLM, Malta, Montana (inspect corrals and
 disposal facilities)
 Aug. 18 Mr. Nicholas Mariana, BSF&W, Portland (show Bison Range
 movie)
 Aug. 18 Dr. John T. Harris, Wildlife Extension Specialist, U of M
 Wildlife Coop. Unit, and Ken Greer, State Fish & Game
 Dept., Bozeman (inspect elk-study holding pens)
 Aug. 21 Dr. E. W. Pfeiffer, U of M, Missoula and Dr. Vladimir
 Sokolov, Prof. of Vertebrate Zoology, Moscow University,
 U.S.S.R. (special tour and photography)
 Sept. 8 Mr. George Devan, Ravalli Refuge, Stevensville (cooperation)
 Sept. 17 Mrs. Dave Harriman, St. Ignatius (interview on roundup for
 Hellgate Herald)

Sept. 17 Dr. John Corcoran, Veterinarian, St. Ignatius (buffalo losses)
 Sept. 18 Dr. Wm. Jellison, Rocky Mtn. Research Laboratory, Hamilton (buffalo losses)
 Sept. 24 Mr. Jerry Ridgeway, Division of Wildlife Services, Missoula (cooperation)
 Sept. 25 Mr. Joe Van Wormer, Bend, Oregon (information for book "Where and When to see Big Game Animals")
 Sept. 27 Mr. John F. Shannon, SCS, Polson (cooperation)
 Sept. 30 Messrs. Robert Ross, SCS, Butte and Larry Osburnsen, SCS, Missoula (discuss range survey and range inspection tour)
 Oct. 5 Messrs. Wynn Freeman and Merle Rognrud, State Fish & Game, Helena (cooperation - antelope roundup)
 Oct. 5 Mr. John R. Langenbach, BSF&W, Federal Aid, Portland (courtesy visit)
 Oct. 5 Mr. J. F. Steiner, BSF&W, Federal Aid, Wash., D. C. (courtesy visit)
 Oct. 5 Mr. Ash Brann, GMA, Helena (law enforcement instruction)
 Oct. 5 Mr. Jack L. Richardson, Job Corps, Malheur Refuge (visit during roundup)
 Oct. 11 Mr. Mel Ruder, Hungry Horse News (photos and story of roundup)
 Oct. 11 Messrs. Marvin Kaascke and Norman Warnicke, CMR, (buffalo transfer)
 Oct. 11 Dr. John Corcoran, USDA Veterinarian, St. Ignatius and Mr. Bob Manlove, Livestock Inspector, Missoula (buffalo vaccination and inspection at roundup)
 Oct. 16 Mr. Melvin Morris, Range Specialist, U of M, Missoula (discuss range problems)
 Oct. 26 Mr. James McLucas, State Fish and Game, Helena (cooperative antelope roundup)
 Nov. 3 Messrs. Jerry Ridgeway and Elmer Hitchcock, Wildlife Services, Missoula (cooperation)
 Nov. 9 Mr. Joe Kombo, CMR, Fort Peck (pick up fence posts)
 Nov. 9 Mr. Tom Davies, Ravalli Refuge (transfer of picnic tables)
 Nov. 9 Mr. James McLucas, State Fish and Game Dept. (pickup antelope trap material)
 Nov. 19 Messrs. John Peters, Habitat Evaluation Leader, Helena; Robert Schumacher, District Fisheries Mgr., Kalispell; and Delano Hanzel, Fisheries Biologist in charge of Flathead Lake Fisheries study, State Fish and Game Dept. (flood control work on Jocko River)
 Nov. 30 Mr. Richard D. Mundinger, Division of Realty, Portland (quarters appraisal)
 Dec. 2 Mr. Nick H. LaFrantz, Havre, Wildlife Services (cooperation)
 Dec. 4 Messrs. Gerry Atwell, U of M Wildlife Research Unit and John Harris, Wildlife Extension Specialist (photography)
 Dec. 6 Dr. William Longhurst and Mr. Guy Connelly, U of Cal., Hopland Field Station, Hopland, Calif. (collection of big game study material)
 Dec. 7 Mr. Marion Malone, BIA, Reclamation (cooperation)
 Dec. 8 Messrs. John C. Moe, FBI, Missoula and John Corbett, Indian Policeman, BIA, Dixon (illegal deer kill on Bison Range)

- Dec. 9 Montana Fish and Game Dept. personnel Faye Couey, Kalispell, Richard Weckwerth-Kalispell, Otis Robbins-Kalispell, Robert Carroll-Helena and Keith Seaburg-Missoula (photograph shooting of buffalo)
- Dec. 9 Mr. Jim Ramsey, Warden, State Fish and Game Dept., Missoula (illegal deer kill on Bison Range)
- Dec. 15 Mr. George Ostrum, Free-lance photographer, Kalispell (photography)

C. Refuge Participation

Henry

- January 23 Attended annual meeting of Montana Wilderness Ass'n. in Missoula.
- February 15 Attended meeting of Federal Businessmen's Ass'n. in Missoula.
- March 15 Attended meeting of Federal Businessmen's Association in Missoula.
- March 23 Showed film "Plants, Animals and Geography" to Charlo Lions Club.
- March 24 Gave Slide-Talk to Charlo Garden Club.
- April 9 Attended Wildlife Society Meeting in Missoula.
- April 14 Gave tour and talk to Ambassador Choir, Multnomah School of the Bible, Portland, Oregon.

Mazzoni

- June 18-19 Attended Annual Montana Wildlife Federation Convention and banquet in Polson.
- July 19 Conducted short tour around exhibition pasture for teacher Don Hinckley and 50 Project Headstart students from St. Ignatius, Montana.
- July 26 Attended job planning session with BIA Kickinghorse Job Corps Center personnel at Flathead Agency.
- August 21 Conducted range tour for Dr. E. W. Pfeiffer, U of M, Missoula, and Dr. Vladimir Soloslov, Prof. of Vertebrate Zoology, Moscow University, Moscow, U.S.S.R.
- Aug. 28-29 Attended the Montana Chapter of the Wildlife Society field techniques meeting at Mammoth Hot Springs, Yellowstone National Park, Wyoming.
- Sept. 16 Gave a talk and short tour for Profs. Neil West and George B. Golthays and 28 students from the Dept. of Range Science, Utah State University.
- Sept. 30 Attended public meeting in Missoula conducted by Secretary of the Interior Stewart Udall and Senator Lee Metcalf regarding natural resource problems.
- Oct. 16 Range inspection tour with Prof. Melvin Morris, Range Specialist, U of M, and three range management graduate students from the University.
- Nov. 18 With Manager Kenney, participated in the Annual Placement Program at the University of Montana.
- Nov. 19 Attended meeting of Lake County Rural Development Committee in Ronan, Montana.

Dec. 2 Discussed various refuge management programs with 40 members of Western Montana Fish and Game Association at Committee Meeting in Missoula.

Dec. 15 With Assistant Nail, attended Salish-Kootenai Tribal Council meeting at Dixon Agency.

Various Attended regular monthly meetings of the Federal Businessmen's Ass'n. in Missoula, and the regular bi-weekly meetings of the Charlo Lions Club.

Kenney

Oct. 12 Gave a short talk to the 7th and 8th grades of Charlo School - here to observe roundup.

Nail

Dec. 15 With Manager Mazzoni attended Tribal Council meeting.

Dec. 20 With Mazzoni attended Federal Businessmen's Ass'n. meeting in Missoula.

May

Mar. 25 Attended hearing on Kicking Horse Job Corps Camp.

Mar. 26 Gave slide-talk to Dixon School.

May 20 Gave talk and tour around exhibition pasture to 45 First Grade students from Arlee School.

May 21 Gave talk and tour around exhibition pasture to 50 Fourth Grade students from Ronan School.

May 27 Conducted a short tour and gave a talk on management to 53 students from the Hot Springs Junior High School.

July 16 Gave tour of range for Rev. R. Wilbur Simmons and group of 25 persons from United Church of Christ in Billings, Montana.

Aug. 17 Conducted range tour for United Church of Christ group from West Palm Beach, Florida.

Kraft

Conducted tour for Chief Elmer Graham, Navy Recruiter, Missoula; Mrs. J. B. Wrenn, National Commander, Navy Mother's Club of America, Gretna, La.; and three delegates of Navy Mother's Club.

June 5 Gave tour and talk on management to 140 Zoology students from University of Montana.

Aug. 2 Conducted range tour for Bill Nelson, Willow Ranch, Jackson, Montana and 18 guests from the Dude Ranch.

Nov. 5 Gave a talk and range tour to Dr. Frank Evans and a class of 10 Social Ecology students from Coeur d'Alene Junior College.

Hogge

May 17 Gave slide-talk to Charlo sixth, seventh and eighth grades.

Sept. 1 Gave short photographic tour for Rolf W. Germann, Fairfield, Conn., Jung A. German, Altamirana, Mexico, and Robert T. Harild, Brookline, Mass.

Largent

July 30 Conducted range tour for Postal Dept. employees Mr. & Mrs. Tony Gerber-Great Falls, Mr. & Mrs. Joe Oakley-Seattle, and Mr. & Mrs. Laurence Driscoll-Charlo.

Anderson

July 10 Conducted Dr. Frank Richardson from the U of M Biological Station and 15 Ornithology students on tour of range.

July 14 Conducted Dr. Richard J. Vogel from the U of M Biological Station and 14 General Ecology students on tour of range.

July 26 Conducted range tour for Dr. John H. Thomas from the U of M Biological Station and class of four Plant Taxonomy students.

D. Hunting

There is no public hunting on the Bison Range. General hunting conditions in the Lower Flathead Valley have been discussed in the Ninepipe Narrative Report.

E. Fishing

Public fishing has never previously been authorized on the Bison Range. On October 25, 1965, a fishing management plan was prepared and later approved by the Regional and Central Offices for public fishing on approximately 1.5 miles of the Jocko River, which is located near the south boundary of the refuge. The construction of a big game fence on the north side of the Jocko, between the river and the main body of the refuge, made fishermen access to the two small tracts of land thus cut off from the Range administratively acceptable. This portion of the Jocko will be legally open to public fishing for the first time in 1966.

F. Violations

Only two known violations occurred on the refuge during the year. On November 28, retired Refuge Foreman Cy Young observed a hunter just outside the boundary fence, about one-quarter mile north of the Moiese Store, shoot two Canada geese out of the resident goose flock as they flew out over the dryland alfalfa field on the north side of Mission Creek. One of the birds fell just outside the fence and one about 50 yards inside the fence on refuge land. By the time refuge personnel arrived, the hunter had retrieved his birds, been picked up by hunting companions in a car, and was gone. He was never apprehended.

At approximately 3:00 a.m. on the morning of December 8, two men and their two women companions drove into the picnic area and shot a tame white-tailed doe with a .22 pistol. They loaded the deer into their car and left. Nothing remained to indicate that a deer had been killed except a pool of blood. The two men, James Irvine the driver of the car, and Henry Charette the owner of the

car, would undoubtedly have escaped apprehension had they not run afoul of the Missoula City police. The deer meat was found in their car and they were subsequently turned over to State Game Wardens. One of the women companions, Shirley Henry, made a complete statement regarding the shooting, implicating Irvine as the one who shot the deer. The men were charged by the State with possession and transportation of an unlawfully killed game animal. Charette pleaded guilty and was fined \$200.00. He served it out in the County jail at the rate of \$2.00 per day. James Irvine pleaded innocent, and chose to have a jury trial. Shortly before the trial was scheduled to be held, he changed his plea to guilty, was found guilty and fined \$250.00. He paid the fine.

The interesting thing about this case is that James Irvine is an Indian, registered on the Tribal roles at the Flathead Agency. The Flathead Indians have long held that Indian hunting rights on the Bison Range were not affected by the purchase of these lands by Congress from the Tribe in 1908 for the establishment of a bison preserve. The surprising thing is that, in the long history of the Bison Range, this contention has never been tested in a court of law. The implications of this case are obvious. If Irvine is to be charged with violation of a federal game law, that is, illegal hunting and killing of a game animal on a National Wildlife Refuge, the Bureau's position must be firmly established. For that reason, a charge against Irvine is being held in abeyance pending a decision of the Solicitor's office in Portland, Oregon.

G. SAFETY

Scheduled SAFETY meetings, with the main topics as described, were held as follows:

- | | |
|---------|---|
| Jan. 13 | The film "Fireman at Your Door" was shown and the hazards of winter driving were discussed. |
| Feb. 10 | The films "SAFETY, Everywhere, All the Time" and "Seven Enemies of SAFETY" were shown. |
| Mar. 10 | Annual report of personal injuries and vehicle accidents was read and discussed. The film "The Pulse of Life" was shown. |
| Apr. 16 | Reviewed President Johnson's SAFETY 70 program. Snake-bite kits and their use was discussed. |
| May 12 | The film "Grass and Brush Fire Fighting" was shown. |
| June 9 | Reviewed current SAFETY Sentinel and discussed hazards involved in the use of pesticides. |
| July 14 | The film "The Gamblers" was shown. Refuge equipment hazards were discussed. |
| Aug. 11 | The two Caterpillar Company films "Vacation SAFETY" and "Help Yourself to SAFETY" were shown. The station fire plan was reviewed and discussed. |
| Sept. 8 | An open discussion was held on a systematic plan for SAFETY. The safe handling of firearms, both at home and in the field, was stressed. |
| Oct. 6 | Reviewed the President's proclamation on Fire Prevention Week. SAFETY was stressed as being an important segment |

- of the annual buffalo roundup. The SAFETY-graphs "Falls" and "My Aching Back" were presented.
- Nov. 10 The subject of winter driving was discussed and the film "Winter Driving" was shown.
- Dec. 13 The recently completed butchering operation was discussed. Reviewed articles on noise, including hearing loss, carbon monoxide poisoning, and the SAFETY aspect of Christmas decorations.

Quarterly fire drills were held on March 11, May 28, September 8 and December 13.

At the close of the period, we have had 735 days without a lost time accident.

VII. OTHER ITEMS

A. Items of Interest

1. Personnel Transfers, Retirement and Awards

Refuge Manager Cordia J. Henry officially retired on April 24, 1965, upon completion of 30 years Federal service. A retirement party was held in his honor on April 10 at the Moiese Club House. The party was attended by Bureau personnel from the Bison Range and Ninepipe Refuge, and the Ravalli, Medicine Lake, Ruby Lake, Bowdoin, Red Rock Lakes, Benton Lake and National Elk Refuges, and the Charles M. Russell Game Range. Refuge Manager Owen Vivion, Medicine Lake Refuge acted as M.C. and Regional Supervisor Vernon Ekedahl, and ex-Bison Range Manager John E. Schwartz were guest speakers. John Schwartz is now with the U.S.F.S. in Portland, Oregon. A series of tapes which had been routed to C.J.'s many Bureau friends and associates were played during the course of the party, and provided Cordia with his greatest thrill of the evening. C.J. was presented with a bound book of letters from Bureau personnel, a fine collection of woodworking tools for his home shop, an excellent clay model of C.J. punching buffalo on horseback (during his infamous ride off the east slope of South Pauline), by our talented Maintenceman-Sculptor, Ernie Kraft, and a particularly appropriate live-mount of a Coot. C.J. and Thelma reside on their 160-acre farm about one mile south of the Ninepipe Refuge. A sign at the entrance of the road leading to their beautiful new home proclaims this to be, "Coot Haven".

Wildlife Management Biologist Watson E. Beed, who officially retired on December 30, 1964, was presented with a Meritorious Service Award in June of this year. Watson was a frequent visitor to the Range during the year and contributed a great deal to the orientation and general knowledge of new employees. Having this fine ecologist-naturalist located so conveniently to the Range is a very rare asset to the present staff.

Assistant Manager Jack Richardson accepted a promotion and assignment as Biologist to the Malheur Job Corps Center, Burns,

Oregon, during the latter part of March. The Assistant's position was not filled until December 5, when Melvin Nail was transferred to us from the Sheldon Refuge, Nevada. Mel and wife Mary have two children, Mark-16 months, and Teri-3 months. We are pleased to have Mel on our staff.

Refuge Manager Mazzoni was transferred from the Charles M. Russell Range, Lewistown, Montana, in early June to fill the vacancy created by C.J. Henry's retirement. Joe and wife Nancy have three children, Cindy-8 years, Elizabeth-6 years and Little Joe-4 years, and all find the Bison Range much to their liking.

On May 23, 1965, Heavy Duty Mechanic Grant Hogge was honored in Missoula at the Boy Scout Council Recognition Banquet, and received wood badge recognition as a result of a three-part program related to scouting. We're all very proud of Grant's active participation in the local scouting program. On April 3, Mr. Hogge was elected to a 3-year-term on the District No. 28 School Board, which includes the schools in Ronan, Charlo, Pablo, St. Ignatius and Moiese.

Maintenanceman Ernest W. Kraft was awarded a 10-year pin on September 8, 1965.

2. Miscellaneous

The Bison Range is to participate as a cooperating land management agency in the work program of the BIA Kickinghorse Job Corp Center located near Ronan. Ten projects were submitted and approved for inclusion in the initial work program, with six tentatively scheduled for completion by June 30, 1966. Construction of the Center was nearly completed by the end of the year, and is to receive its' first complement of Corpsman in January, 1966.

The Montana Power Company completed construction of the second power line through the northeast corner of the refuge early in the year. The two power lines are about one-quarter mile apart, parallel each other through the refuge, and are immediately adjacent to the public tour road. These power lines constitute the most serious, aesthetically objectionable installations on the refuge. It's unfortunate that they were ever permitted to be built on refuge lands.

We entered into an agreement with the Salish-Kootenai Tribal Council for a cooperative summer student work program this year. The Tribe paid the student's salaries and we provided work and supervision. Two Indian boys worked on the refuge under this program from August 3 through August 27, and we were extremely pleased with their performance. From all indications, this program will be continued next year.

B. Credits

Mazzoni - those sections and items not listed below.

Nail - Tables II, IV, V, VI, VII, VIII, IX, X, XI; Section VI, B,C and G; and summary of weed control data for NR-12.

May - Summary of accomplishments for Section III, and deer
and elk disposal cost data for Section IV, B.
Kraft - Summary of buffalo roping experiences for Section II.
Hogge - Summary of accomplishments for Section III.
Young - Typing and editing of entire report.
Johnson - Typing captions and mounting pictures.

All personnel contributed to the collection of field data
essential to this report.

C. Photographs

Our photo collection was hampered by a malfunctioning 4 x 5
Graflex camera which spoiled many irreplaceable pictures. The
camera is being repaired. A new 35mm Exakta II-B, with 50mm and
200mm lens', was purchased by the Regional Office for assignment
to this station in September. Thirty-five millimeter equipment
previously used was owned by personnel. With the eventual repair
of the 4 x 5, we shall be well equipped for the ensuing year.

Respectfully submitted,



Joseph P. Mazzoni
Refuge Manager

January 26, 1966

Approved:



John A. Laidlaw
Regional Director

UPLAND GAME BIRDS

1613

Refuge National Bison Range Months of January to April, 19 65

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Ring-necked Pheasant	16,000 acres grass- land, shrub & browse	160							100	
Chukar Partridge	" " "	400							40	
Gray Partridge	" " "	80							200	
Dusky Grouse	3,000 acres pine, fir & coulee	50							60	
Ruffed Grouse	300 acres brushy creek bottom	30							15	

3-1752
Form NR-2
(April 1946)

UPLAND GAME BIRDS

1613

Refuge National Bison Range Months of May to August, 1965

(1) Species	(2) Density		(3) Young Produced		(4) Sex Ratio	(5) Removals			(6) Total	(7) Remarks
Common Name	Cover types, total acreage of habitat	Acres per Bird	Number broods obs'd.	Estimated Total	Percentage	Hunting	For Re- stocking	For Research	Estimated number using Refuge	Pertinent information not specifically requested. List introductions here.
Dusky Grouse	3,000 acres conifer type-pine, fir etc.	50	6	35					60	Estimates based on general reconnaissance trips on area.
Ruffed Grouse	300 acres brushy stream bottoms	Unknown								None observed during period.
Chukar Partridge	16,000 acres mixed cover	Unknown							10	Only two birds observed during period - no broods seen.
Gray Partridge	" " "	53	5	100					300	Estimates based on general reconnaissance trips on area.
Ring-necked Pheasant	5,000 acres grass-land & bottoms	33	4	50					150	" " " "

INSTRUCTIONS

Form NR-2 - UPLAND GAME BIRDS.*

- (1) SPECIES: Use correct common name.
- (2) DENSITY: Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED: Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO: This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS: Indicate total number in each category removed during the report period.
- (6) TOTAL: Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS: Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

* Only columns applicable to the period covered should be used.

Refuge NATIONAL BISON RANGE

Months of September to December, 19 65

[illegible]

INSTRUCTIONS

Form NR-2 - UPLAND GAME BIRDS.*

- (1) SPECIES: Use correct common name.
- (2) DENSITY: Applies particularly to those species considered in removal programs (public hunts, etc.). Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) YOUNG PRODUCED: Estimated number of young produced, based upon observations and actual counts in representative breeding habitat.
- (4) SEX RATIO: This column applies primarily to wild turkey, pheasants, etc. Include data on other species if available.
- (5) REMOVALS: Indicate total number in each category removed during the report period.
- (6) TOTAL: Estimated total number using the refuge during the report period. This may include resident birds plus those migrating into the refuge during certain seasons.
- (7) REMARKS: Indicate method used to determine population and area covered in survey. Also include other pertinent information not specifically requested.

* Only columns applicable to the period covered should be used.

3-1753
Form NR-3
(June 1945)

BIG GAME

Refuge NATIONAL BISON RANGE Calendar Year 1965

(1) Species	(2) Density	(3) Young Produced	(4) Removals				(5) Losses			(6) Introductions	(7) Estimated Total Refuge Population		(8) Sex Ratio	
Common Name	Cover types, total Acreage of Habitat	Number	Hunting	For Re- stocking	Sold	For Research	Predation	Disease	Winter Loss	Number	Source	At period of Greatest use	As of Dec. 31	
Bison	15,600 acres grassland	102		3	128			14	2			475	334	1:1.1
Elk	5,000 acres timber & grass land	19	3	2	20			5				85	55	**
Mule Deer	10,000 A. timber, brush & grassland	100			96	1		3				300	200	**
White-tailed Deer	4,000 A. timber, brush & grassland	65			41			6				222	175	**
Bighorn Sheep	8,000 A. timber & grassland	8										48	48***	**
Antelope	6,000 A. grassland	56		55		13		4	2			162****	88	1:1.4
Mountain Goat	2,000 A. timber	-										4	4	1:3
Texas Longhorn Steers	40 A. pasture	-										4	4	-

Remarks: *See text for details. Not all losses necessarily disease oriented. lacking.
 **Removals somewhat selective; therefore, sex ratio based on animals killed not valid. Herd composition data/
 ***One known loss prior to July aerial census.
 ****Total population as of 12/31/64 incorrectly recorded in 1964 Narrative Report as 49.

Reported by _____

INSTRUCTIONS

Form NR-3 - BIG GAME

- (1) **SPECIES:** Use correct common name; i.e., Mule deer, black-tailed deer, white-tailed deer. It is unnecessary to indicate sub-species such as northern or Louisiana white-tailed deer.
- (2) **DENSITY:** Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottomland hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) **YOUNG PRODUCED:** Estimated total number of young produced on refuge.
- (4) **REMOVALS:** Indicate total number in each category removed during the year.
- (5) **LOSSES:** On the basis of known records or reliable estimates indicate total losses in each category during the year.
- (6) **INTRODUCTIONS:** Indicate the number and refuge or agency from which stock was secured.
- (7) **TOTAL REFUGE POPULATION:** Give the estimated population of each species on the refuge at period of its greatest abundance and also as of Dec. 31.
- (8) **SEX RATIO:** Indicate the percentage of males and females of each species as determined from field observations or through removals.

115000

3-1754
Form NR-4
(June 1945)

SMALL MAMMALS

Refuge National Bison Range Year ending April 30, 1965

(1) Species	(2) Density		(3) Removals					(4) Disposition of Furs					(5) Total Popula- tion
Common Name	Cover Types & Total Acreage of Habitat	Acres Per Animal	Hunting	Fur Harvest	Predator Control *	For Re- stocking	For Re- search	Share Trapping			Total Refuge Furs Shipped	Furs Donated	Furs Destroyed
								Permit Number	Trappers Share	Refuge share			
Coyote	18,541 ac.all habitat	1854			1								10
Dogs	" "				1								Transients
Bobcat	" "	927											20
Striped Skunk	2,500 ac. creek bottom	16 1/2			15								150
Badger	10,000 ac. grassland	250											40
Beaver	100 ac. Jocko River & Mission Creek	10											10
Mink	100 ac. drainage	10											10
Muskrat	100 ac. wetlands	1											100
Marmot	10,000 ac. rocky hills	100			1								100
Porcupine	4,500 ac. timber & brush	90			10								50
Raccoon	50 ac. wetlands	3											15
Col.Ground Squirrel	5000 ac. grassland	25											200
Pocket Gophers	10,000 ac. grassland	1											10,000
Meadow Voles	18,541 ac. all habitat	.07											250,000
* List removals by Predator Animal Hunter													

* List removals by Predator Animal Hunter

REMARKS:

Raccoon have never been sighted on the Bison Range, but their tracks are getting more numerous all the time.

Reported by Victor B. May, Acting Refuge Manager

INSTRUCTIONS

Form NR-4 - SMALL MAMMALS (Include data on all species of importance in the management program; i. e., muskrats, beaver, coon, mink, coyote. Data on small rodents may be omitted except for estimated total population of each species considered in control operations.)

- (1) SPECIES: Use correct common name. Example: Striped skunk, spotted skunk, short-tailed weasel, gray squirrel, fox squirrel, white-tailed jackrabbit, etc. (Accepted common names in current use are found in the "Field Book of North American Mammals" by H. E. Anthony and the "Manual of the Vertebrate Animals of the Northeastern United States" by David Starr Jordan.)
- (2) DENSITY: Applies particularly to those species considered in removal programs. Detailed data may be omitted for species occurring in limited numbers. Density to be expressed in acres per animal by cover types. This information is to be prefaced by a statement from the refuge manager as to the number of acres in each cover type found on the refuge; once submitted, this information need not be repeated except as significant changes occur in the area of cover types. Cover types should be detailed enough to furnish the desired information but not so much as to obscure the general picture. Examples: spruce swamp, upland hardwoods, reverting agriculture land, bottom land hardwoods, short grass prairie, etc. Standard type symbols listed in Wildlife Management Series No. 7 should be used where possible. Figures submitted should be based on actual observations and counts on representative sample areas. Survey method used and size of sample area or areas should be indicated under Remarks.
- (3) REMOVALS: Indicate the total number under each category removed since April 30 of the previous year, including any taken on the refuge by Service Predatory Animal Hunter. Also show any removals not falling under headings listed.
- (4) DISPOSITION OF FUR: On share-trapped furs list the permit number, trapper's share, and refuge share. Indicate the number of pelts shipped to market, including furs taken by Service personnel. Total number of pelts of each species destroyed because of unprime-ness or damaged condition, and furs donated to institutions or other agencies should be shown in the column provided.
- (5) TOTAL POPULATION: Estimated total population of each species reported on as of April 30.
- REMARKS: Indicate inventory method(s) used, size of sample area(s), introductions, and any other pertinent information not specifically requested.

PUBLIC RELATIONS

(See Instructions on Reverse Side)

 Refuge National Bison Range

 Calendar Year 1965

1. Visits

 a. Hunting None b. Fishing None c. Miscellaneous 81,600 d. TOTAL VISITS 81,600 *

1a. Hunting (on refuge lands)

TYPE	HUNTERS	ACRES	MANAGED BY
Waterfowl			
Upland Game			
Big Game			
Other			

Number of permanent blinds _____

Man-days of bow hunting included above _____

 Estimated man-days of hunting on lands adjacent to
refuge _____

1b. Fishing (area open to fishing on refuge lands)

TYPE OF AREA	ACRES	MILES
Ponds or Lakes		
Streams and Shores		

1c. Miscellaneous Visits

 Recreation 81,000 Official 500

 Economic Use 100 Industrial None

2. Refuge Participation (groups)

TYPE OF ORGANIZATION	ON REFUGE		OFF REFUGE	
	NO. OF GROUPS	NUMBER IN GROUPS	NO. OF GROUPS	NUMBER IN GROUPS
Sportsmen Clubs			1	40
Bird and Garden Clubs	1	5	1	20
Schools	18	800	4	200
Service Clubs			1	17
Youth Groups	2	85		
Professional-Scientific	2	25	1	46
Religious Groups	4	110	1	40
State or Federal Govt.	1	5		
Other	2	230	1	20

 3. Conducted Tours Total: 78 2,775
Other Activities 108 4,035 10 383

TYPE	NUMBER	TYPE	NUMBER
Press Releases	50**	Radio Presentations	
Newspapers (P.R.'s sent to)	7	Exhibits	
TV Presentations		Est. Exhibit Viewers	

INSTRUCTIONS

Item 1: Total of a, b, and c, equal d.

"Visit" - definition. Any person who is on refuge lands or waters during a day or part thereof for the purpose of: hunting, fishing, bird-watching, recreation, business or economic use, official visit, or similar interest. INCLUDE - those who stop within the refuge while traveling on a public highway because of an interest in the area. EXCLUDE - persons engaged in oil or other industry not directly related to the refuge, persons using refuge as most direct route or principal avenue of traffic, and those boating on navigable rivers or the Intercoastal Canal, unless they stop to observe wildlife on the refuge.

Computing visits. Where actual counts are impractical, "sampling" is used with midweek and weekend samples varied by season or weather. A conversion factor of 3.5 (of passengers per car) is used when accurate figures are not available. Each refuge will develop a conversion factor for boats based on range of usage. Count a camper once for each 24-hour period or fraction thereof.

Item 1a: Acres - of refuge open for each type of hunting.

Managed hunts require check in and out of hunters, issuance of permits, or assignment of blinds.

Other - INCLUDE crow, fox, and similar hunting.

Lands adjacent to refuge. Normally considered within 1 mile or less of boundary, unless established sampling procedures cover a wider area. For big game hunting, the distance may be greater.

Item 1b: Acres of streams open to fishing, if practical; otherwise just miles open. Information on "shores" is primarily for coastal fishing.

Item 1c: Recreation. INCLUDE photography, observing wildlife, picnicking, swimming, boating, camping, visitor center use, tours, etc. TOTAL Recreation, Official, and Economic Use visits under Item 1.

Industrial. INCLUDE persons engaged in industry, i.e., oil industry or factories. EXCLUDE these from Item 1.

Item 2: INCLUDE the "On Refuge" groups in Items 1c and 1. In "Off Refuge" column include only those group meetings in which refuge employees actually participate. EXCLUDE these from Items 1c and 1.

Item 3: Exhibits - INCLUDE displays, fairs, parades, and exhibits OFF the refuge; EXCLUDE those ON.

3-1758

Form NR-8

(Rev. Jan. 1956)

Fish and Wildlife Service Branch of Wildlife Refuges

CULTIVATED CROPS - HAYING - GRAZING

Refuge National Bison Range County Lake State Montana

Cultivated Crops Grown	Permittee's Share Harvested		Government's Share or Return				Total Acreage Planted	Green Manure, Cover and Water- fowl Browsing Crops Type and Kind	Total Acreage
	Acres	Bu./Tons	Harvested		Unharvested				
			Acres	Bu./Tons	Acres	Bu./Tons			
None									
								Fallow Ag. Land	

No. of Permittees: Agricultural Operations None Haying Operations None Grazing Operations 2 (Refuge Personnel)

Hay - Improved (Specify Kind)	Tons Harvested	Acres	Cash Revenue	GRAZING	Number Animals	AUM'S	Cash Revenue	ACREAGE	
Grass - for use as feed	50	40	None	1. Cattle					
				2. Other	2 horses	24	24.00		
				1. Total Refuge Acreage Under Cultivation					40
Hay - Wild				2. Acreage Cultivated as Service Operation					40

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS - HAYING - GRAZING

Report Form NR-8 should be prepared on a calendar-year basis for all crops which were planted during the calendar year and for haying and grazing operations carried on during the same period.

Separate reports shall be furnished for Refuge lands in each county when a refuge is located in more than one county or State.

Cultivated Crops Grown - List all crops planted, grown and harvested on the refuge during the reporting period regardless of purpose. Crops in kind which have been planted by more than one permittee or this Service shall be combined for reporting purposes.

Permittee's Share - Only the number of acres utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. Report all crops harvested in bushels or fractions thereof except such crops as silage, watermelons, cotton, tobacco, and hay, which should be reported in tons or fractions thereof.

Government's Share or Return - Harvested - Show the acreage and number of bushels harvested for the Government of crops produced by permittees or refuge personnel. Unharvested - Show the exact acreage and the estimated number of bushels of grain available for wildlife. If grazing is made available to waterfowl through the planting of grain, cover, green manure, grazing or hay crops, estimate the tonnage of green food produced or utilized and report under Bushels Unharvested column.

Total Acreage Planted - Report all acreage planted, including crop failures.

Green Manure, Cover and Waterfowl Grazing Crops - Specify the acreage, kind and purpose of the crop. These crops and the acreage may be duplicated under cultivated crops if planted during the year, or a duplication may occur under hay if the crop results from a perennial planting.

Hay - Improved - List separately the kinds of improved hay grown. Annual plantings should also be reported under Cultivated Crops, and perennial hay should be listed in the same manner at time of planting.

Total Refuge Acreage Under Cultivation - Report total land area devoted to agricultural purposes during the year.

REFUGE GRAIN REPORT

CALENDAR YEAR 1965

Refuge National Bison Range

Months of _____ through _____, 195

(1) VARIETY*	(2) ON HAND BEGINNING OF PERIOD	(3) RECEIVED DURING PERIOD	(4) TOTAL	(5) GRAIN DISPOSED OF				(6) ON HAND END OF PERIOD	(7) PROPOSED OR SUITABLE USE*		
				Transferred	Seeded	Fed	Total		Seed	Feed	Surplus
Oats	241*	790	1031			84	84	947		947	
Wheat	205	200	405			213	213	192		192	
Barley	179	230	409			330	330	79		79	

790 bushels oats received from Kootenai Refuge 11/17/65; 200 bushels wheat from Medicine Lake Refuge 9/22/65; and 230 bushels barley from Ravalli Refuge 10/4/65.

(8) Indicate shipping or collection points _____

(9) Grain is stored at Headquarters granaries

(10) Remarks *1964 NR form lists 110 bushels of oats on hand as of 12/31/64,—this was in error and should have been listed as 241 bushels.

*See instructions on back.

REFUGE GRAIN REPORT

This report should cover all grain on hand, received, or disposed of, during the period covered by this narrative report.

Report all grain in bushels. For the purpose of this report the following approximate weights of grain shall be considered equivalent to a bushel: Corn (shelled)—55 lb., corn (ear)—70 lb., wheat—60 lb., barley—50 lb., rye—55 lb., oats—30 lb., soy beans—60 lb., millet—50 lb., cowpeas—60 lb., and mixed—50 lb. In computing volume of granaries, multiply the cubic contents (cu. ft.) by 0.8 bushels.

- (1) List each type of grain separately and specifically, as flint corn, yellow dent corn, square deal hybrid corn, garnet wheat, red May wheat, durum wheat, spring wheat, proso millet, combine milo, new era cowpeas, mikado soy beans, etc. Mere listing as corn, wheat, and soybeans will not suffice, as specific details are necessary in considering transfer of seed supplies to other refuges. Include only domestic grains; aquatic and other seeds will be listed on NR-9.
- (3) Report all grain received during period from all sources, such as transfer, share cropping, or harvest from food patches.
- (4) A total of columns 2 and 3.
- (6) Column 4 less column 5.
- (7) This is a proposed break-down by varieties of grain listed in column 6. Indicate if grain is suitable for seeding new crops.
- (8) Nearest railroad station for shipping and receiving.
- (9) Where stored on refuge: "Headquarters granary," etc.
- (10) Indicate here the source of grain shipped in, destination of grain transferred, data on condition of grain, unusual uses proposed.

ANNUAL REPORT OF PESTICIDE APPLICATION

Proposal Number

Reporting Year

1965

INSTRUCTIONS: Wildlife Refuges Manual, secs. 3252d, 3394b and 3395.

Date(s) of Application	List of Target Pest(s)	Location of Area Treated	Total Acres Treated	Chemical(s) Used	Total Amount of Chemical Applied	Application Rate	Carrier and Rate	Method of Application
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
July 9	Spotted Knapweed (<u>Centaurea maculosa</u>)	Saddle on Tower 2 road	.06	2,4-D Amine	8 Oz.	2# a.e./acre	8-oz./2.5 gal. water	Back-pack Sprayer
July 8-9	St. Johnswort (<u>Hypericum perforatum</u>)	Head of Elk Creek between Tower 2 & Highpoint, & head of Trisky Creek	500	2,4-D Amine	245 gals.	40 acres @ 1.5 a.e./acre & 460 acres @ 2# a.e./acre	1 gal. 2,4-D/3 gal. water	Helicopter
May 18 thru July 1	Canada thistle (<u>Cirsium arvense</u>)	Roadsides, ditch banks, Mission Cr. & Alex. Basin	810	2,4-D Amine	410 gals.	2# a.e./acre	580 A. @ 1 to 3; 12 A. @ 1 to 20; 79 A. @ 1 to 40; 138 A. @ 1 to 100	Kromer & Bean Sprayer & Helicopter

10. Summary of results (continue on reverse side, if necessary) Spotted Knapweed - initial 95 to 100% kill within two weeks following treatment.

St. Johnswort - (summary of observations during four weeks following treatment) In rugged terrain adjacent to Tower 2 road (head of Elk Creek), where copter had most difficulty spraying at proper height and speed, plants obviously killed, 5 to 10%. Remainder of plants showed varying degrees of effects. In many cases lower parts of plants dead, but upper portions green and producing seed pods. Results may have been better than it appeared, as treatment seemed to have interfered with seed production in those plants not killed. Seed produced was obviously not viable. Chokecherry and mock orange showed marked effects - 80 to 90% of upper portion of these shrubs quite dead, but basil growth in most cases unaffected. Conifers showed no adverse effects. In those areas in which copter was able to achieve proper application, excellent initial kill was achieved. Area above Tower 2 road near turnoff to Wildhorse Mesa good example. Those test areas sprayed at rate of 1.5# of 2,4-D/acre (40 acres in the head of Trisky Creek) indicated very poor results - 5 to 10% kill at most, with little evidence of spraying on plants. Seed produced in this area definitely viable. We had sufficient evidence to confirm that 2# of 2,4-D/acre will effectively kill goatweed if properly

applied. A more accurate evaluation of the entire program can be made in the spring of 1966.

Canada thistle - Areas sprayed with ground equipment indicated good initial kill, ranging from 50 to 95%, except those areas sprayed in May. May spraying is definitely too early for effective results. Effects of aerial spraying was extremely variable, and in many cases for no apparent reason. Initial kill in most aerially sprayed areas was 50 to 75 percent; however, in some areas 10 to 25% kill was indicated. A final evaluation can be made in the spring of 1966.

Cost Summary:

Spotted knapweed

Materials	\$.12
Labor	2.60
Equipment	1.00
Total	3.72
Cost /Acre	\$62.00

St. Johnswort

Materials	\$458.15
Labor	261.80
Equipment	738.00*
Total	1,457.95
Cost/Acre	2.91

*Helicopter contracted at \$1.25/acre.

Canada thistle

Materials	\$ 809.54
Labor	625.20
Equipment	698.50
Total	2,133.24
Cost/acre	2.63*

*Average cost/acre for both ground and aerial application.
Aerial application cost/acre - \$2.06
Ground application cost/acre - \$4.08

Note: Helicopter paid on a per hour basis with actual cost per acre considerably less than \$1.25.

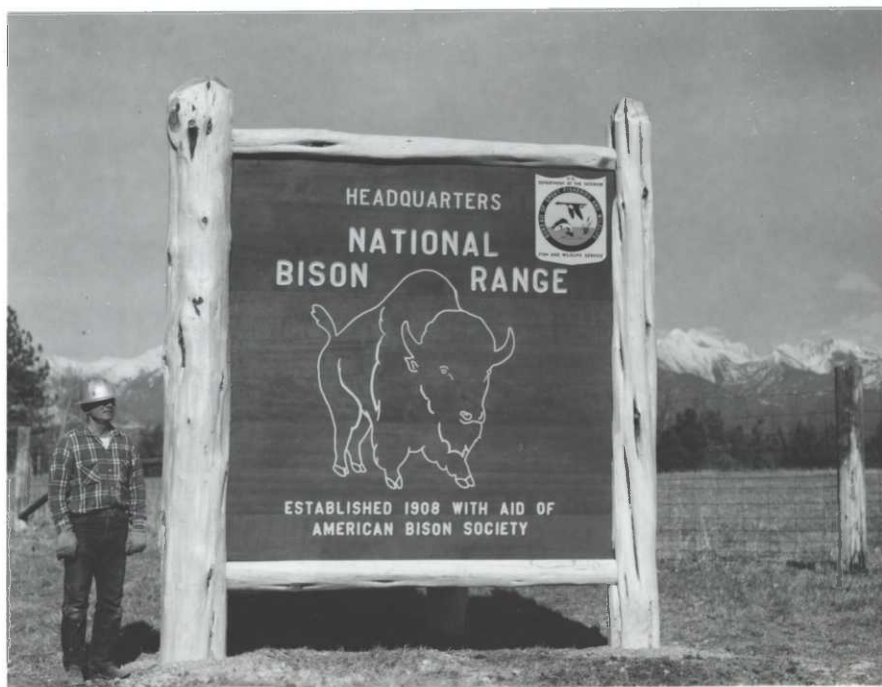
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Abbreviation	Target Pest(s)	Location of area	Treated acres	Used Chemical(s)	Chemical applied	Rate	Unit	Application
Date(s) of	Use of	Location	Total		Total amount			Method

INSTRUCTIONS: Machine before Manual, test, 35234, 33449 and 3342

ANNUAL REPORT OF PESTICIDE APPLICATION



January, 1965. Drifts along tour road reached 30' in depth in some places. May



April, 1965. New sign installed at entrance to refuge headquarters. Identical sign installed on Ravalli Hill adjacent to State Highway 93 in October. May



June 13, 1965. Mission Range Riders sponsored saddle club ride - Elk Creek - about 210 riders. All refuge personnel participated. May



June, 1965. Intermittant rains complicated haying operations. Damp hay was stacked outdoors before placing in barn. Largent & Krantz in photo. Mazzoni



June, 1965. Removal of silt deposited by 1964 flood waters in the display pond, was completed & the pond re-filled by late June. The silt material was used to fill small depressions in and around the pond & picnic areas. All exposed areas were reseeded in September. Mazzoni



July, 1965. Installation of pump house & related facilities for picnic area sprinkler system. Mazzoni



June, 1965. CMP w/riser headgate installed in headquarters display pond in May, washed out in time. Use of interlocking steel piling corrected problem. Mazzoni



July, 1965. St. Johnswort spray program in the head of Elk Creek. Limitations of helicopter became readily apparent in this rugged terrain. Mazzoni



July, 1965. Roof of office, pump house, shop, storage buildings were painted by contractor. Exterior walls of five headquarters buildings were painted by refuge personnel. Mazzoni



July, 1965. We arranged for application of oil penetrating coat and layer of rock chips on headquarters display pasture tour road by Montana State Highway Commission. Vastly improved condition of road and eliminated dust problem. Mazzoni



July, 1965. Buffalo corrals required extensive maintenance and repairs prior to Roundup. The entire side of corral shown in center of picture had to be replaced. Many new safety features were added. Crew confer-
ring with Foreman May. Mazzoni



August, 1965. Improvements to the slaughter house included a concrete foundation under the north side of building, where none existed before; a new modern rest room facility, replacing outdoor pit-type toilets with their objectionable health standards; a new concrete step for bachelor quarters. Mazzoni



August 3, 1965. Refuge Manager Mazzoni congratulating Biologist Watson Beed following presentation of Meritorious Service Award. Watson's retirement was effective December 30, 1964. Witnessing presentation are Young, Anderson, Hogge, Kraft, Bauer, Largent & Taylor. May



September, 1965. Construction of foundation for new 1,100 bu. capacity metal granary at headquarters. Temporaries Rodgers, Lampshire & Taylor. Mazzoni



September, 1965. Replacement of all wood material in upper Mission Creek bridge. Tribal Council issued us free-use permit to obtain pole stringers off Flathead Reservation. Mazzoni



October, 1965. About 1.5 miles of fence had to be completely rebuilt on refuge lands which lie east of Highway 93 to prevent trespass grazing. These lands are no longer contiguous with the refuge proper, and the fences had not been maintained for several years. Neuman, May & Rodgers. Mazzoni



1964 flood damage on south bank of Mission Creek adjacent to picnic area. May.



Same section of stream following reconstruction of bank and application of rip-rap in 1965. Rip-rap material was contracted for \$4.00 per yard, delivered to job. The rock barrier constructed out into the stream to deflect the current and reduce the cutting action against the bank has worked very well. Fence was moved back from the bank into the trees. May



Mission Creek bank erosion just below headquarters bridge, 1964. Mazzoni



Same section with stream barrier in foreground. The barrier has effectively deflected the current to the center of the stream, and the eddies found behind the barrier provide excellent fish habitat. Mazzoni



October, 1965. This beautiful specimen voluntarily entered one of our idle headquarters display pastures and made himself available to our pet female, of the same species, for nuptial purposes. He was released back to the range in November. We are looking forward to newborn additions to our display group next spring. Mazzoni



October, 1965. Family group of bighorn sheep. A total of eight lambs were recorded for the year. Mazzoni



October, 1965. This inquisitive young ram typifies the general unwariness of the Bison Range bighorn population, and explains their popularity with photographers from throughout the West. The photographer in this instance was only 50 to 75 feet from the subject. Mazzoni